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AIR POLLUTION ASPECTS OF EMISSION SOURCES: COKE OVENS

A BIBLIOGRAPHY WITH ABSTRACTS

ENVIRONMENTAL PROTECTION AGENCY

MARCH 1974

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Air Pollution Technical Information Center

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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AIR POLLUTION ASPECTS OF EMISSION SOURCES: COKE OVENS A BIBLIOGRAPHY WITH ABSTRACTS

INTRODUCTION

The Air Pollution Technical Information Center (APTIC) of the Office of Air Quality Planning and Standards prepared, selected, and compiled the approximately 235 abstracts in this bibliography. The abstracts are arranged within the categories listed in the Contents. The abstracted documents are thought to be representative of available literature, and no claim is made to all-inclusiveness.

The subject and author indexes refer to the abstracts by category letter and accession number. The author index lists all authors individually; primary authorship is indicated by an asterisk. Generally, higher accession numbers have been assigned to more recent documents.

Current information on this subject and many others related to air pollution may be found in APTIC's monthly abstract bulletin.*

All of the documents abstracted by APTIC are currently on file at the Air Pollution Technical Information Center, Office of Air Quality Planning and Standrds, Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Readers outside of the U.S. Environmental Protection Agency may seek the documents directly from publishers, from authors, or from libraries.

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*"Air Pollution Abstracts", Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price: $27.00 per year; $6.75 additional for foreign mailing. (More than 6300 abstracts, subject and author indexes are included in each issue, plus two separate indexes.)

A. EMISSION SOURCES

05005

R. P. Hangebrauck, D. J. von Lehmden, and J. E. Meeker

SOURCES OF POLYNUCLEAR HYDROCARBONS IN THE ATMOSPHERE. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (PHS Publ. No. 999-AP-33.) 1967. 48 pp.

Rates of emissions of polynuclear hydrocarbons were measured at several sources considered likely to produce such emissions. The sources included heat generation by combustion of coal, oil, and gas; refuse burning; industrial processes; and motor vehicles. The annual emissions of benzo(a)pyrene in the United States were estimated for each of the sources surveyed, to provide a rough gauge of the importance of each source. Small, inefficient residential coal-fired furnaces appear to be a prime source of polynuclear hydrocarbons; other sources may be of local importance. Production of polynuclear hydrocarbons was generally associated with conditions of incomplete combustion. (Author abstract)

05108

J. D. Doherty and J. A. DeCarlo

COKING PRACTICE IN THE UNITED STATES COMPARED WITH SOME WESTERN EUROPEAN PRACTICES. Blast Furnace Steel Plant 55 (2), 141-53 (Feb. 1967). (Presented at the International Congress of Charleroi, Belgium - Coke in the Iron and Steel Industry, Sept. 1966.)

The operation of coke plants or coke-plant practice in the United States is reviewed and compared with coke-oven practice in certain countries of Western Europe. Data on coals carbonized and production and yields of coke and principal by-products in the United States have been compiled by the Bureau of Mines. Similar data for European countries were obtained from various publications of the Economic Commission for Europe and official publications of the respective countries. In the United States, coke-oven operations are governed largely by demand for blast-furnace coke which in 1964 required 85 per cent of the output of oven coke. Foundry coke requirements amounted to roughly 5 per cent of the total. Thus, it is estimated that approximately 90 per cent of the coke output was used in metallurgical applications. For this reason, coke ovens are operated principally to produce the maximum quantity of metallurgical coke. Although metallurgical coke is the major coke -oven product in Europe, coke-oven gas is also important in Great Britain, West Germany, France, and other countries. Owing to the lack of adequate crude petroleum resources in these countries, more emphasis is placed on the extraction and processing of the crude tar and light oil. One aspect where there are several fundamental differences is the charge preparation. In American plants the moisture content of the coking coal admixtures generally is lower than in most European plants, whereas the volatile matter is higher. Bulk density in European plants is generally lower. Coke yields are high in Europe, whereas tar and light-oil yields are lower. Carbonizing conditions are also slightly different, as American plants use higher wall temperatures and faster coking rates than most of those in Europe. Coke-oven dimensions, except for width, have increased in most of the countries and are similar exclusive of the large-capacity or high ovens. These are just coming into commercial realization in the United States, whereas some batteries of 5- and 6-meter ovens have been operating for many years in several European countries.

06582

RESTRICTING EMISSION FROM GAS GENERATORS IN COKE AND GAS PLANTS. (Auswurfbegrenzung Generatoren Kokereien und Gaswerke.) VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany. (VDI 2290.) 19pp. (June 1962). Ger. (Tr.)

The purposes of this specification are: to describe the operation of gas generators and to analyze the factors influencing the emission of gas and sulfur dioxide; to indicate measures for reducing the emission of dust and sulfur dioxide; and to establish conditions and guide values for restricting the emission of dust and sulfur dioxide.

08392

J. D. Clendenin

THE UTILIZATION OF COAL. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem. Preprints, 9(2):222, 1965. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

A brief survey is presented of current and prospective utilization of coals including lignite, (1) in the production of metallurgical, chemical and specialty cokes, (2) as fuel for process steam, space and home heating, locomotives and ship bunkers, (3) In the manufacture of industrial producer gas and gas for chemical synthesis, (4) as fuel in cement and lime kiln firing, (5) at steel and rolling mills and (6) in a variety of specialty and/or non-fuel uses, including industrial carbons, active carbon, fillers, filter aids and media, water treatment, foundry facing, road building, roofing and coating applications, barbecue briquets, fertilizer and soil conditioner, coal-based plastics, etc. Insofar as possible, information is presented on process and product research and other developments that may affect coal utilization, favorably or unfavorably, in the areas cited. Since economics of coal utilization cannot be divorced from economics of coal supply and transportation, these are touched upon briefly. (Author's abstract)

09737

Ozolins, G. and C. Behmann

AIR POLLUTANT EMISSION INVENTORY OF NORTHWEST INDIANA. (A PRELIM- INARY SURVEY, 1966.) Public Health Service, Durham, N. C., National Center for Air Pollution Control, APTD-68-4, 36p., April 1968.

Sources of air pollutant emissions were surveyed to quantify the total pollution load emitted to the air over the Northwest Indiana communities of East Chicago, Gary, Hammond, and Whiting. The emissions are reported on an annual basis and

subdivided into the five major pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. The four major source catagories that were utilized in reporting emissions from area and point sources are: fuel combustion in stationary sources, fuel combustion in mobile sources, combustion of refuse, and industrial process losses. The results of this survey are reported by city and illustrated on the grid system established by the Northwest Indiana Air Resource Management Program. (Authors' abstract)

11901

Edel'man, I. I. and N. D. Khizhnyak

HARMFUL ATMOSPHERIC EMISSIONS FROM A PHENOL PLANT. ((Vrednyye vybrosy fenol'nogo zavoda v atmosferu.)) Text in Russian. Koks i Khim, Vol. 5:40-42, May 1968.

The emissions from a plant for the production of phenol can be divided into those from the storage tanks for raw materials (products of the coke and chemical industry) and intermediate or final products, ventilatory emissions, and emissions from various other steps in the production process: crucibles, crystallizers, condensers, washers, scrubbers, pressurized supply tanks, and apparatus for the separation of pyridine sulfate. Particular attention is given here to emissions from the phenol-cresol works (amounting to 900 kg of hydrocarbons and 1150 kg of phenol per day), the pyridine works (264 kg of hydrocarbons and 142 kg of pyridine bases per day), and the naphthalene works (emission of 1500 kg/day, including about 1200 kg of naphthalene). These large amounts are due principally to the high volatility of these compounds and the fact that many of the procedures require high temperatures. In order to control these losses, it is suggested that the design of the condensers working in conjunction with the scrubbers be improved, and that the storage tanks be equipped with absorbers, traps and an equilibrating system. It is also pointed out, however, that such measures are not always desirable under all conditions.

13219

Masek, Vaclav

ARSENIC IN COKE. (Arzen v koksu). Hutnicke Listy (Prague), 24(5):323-325, 1969. 18 refs.

Arsenic contained in coal used in coke ovens directly influences the quality of the coke and consequently the quality of cast iron and steel and of electrodes. The material of primary importance is black coal, in which arsenic is not evenly distributed. Arsenic content in a combustible is determined either by change of arsenic compounds to gaseous arsenic oxides or by transformation of arsenic compounds to volatile arsenic trichloride. Field testing of 35 specimens showed that the arsenic content is very low (0.002 to 0.005 mg/cu m). The present average value of arsenic allowed is 0.3 mg/cu m. In all places tested, the measured value was much lower than the allowable average. Dust taken from different strata at the test locations showed greater amounts, but still within the allowed limits.

13330

Unterberger, O. G. and M. S. Gofman

DUST FORMATION DURING IMPACT IN HAMMER CRUSHERS. Coke Chem. (USSR) (English transl.), no. 11:44-48, 1968. 3 refs.

A mathematical analysis of the dust yield obtained from raw coal mixtures crushed in hammer crushers is presented. Tests performed with a laboratory-sized hammer crusher gave results that were in close agreement with the theoretical approach. Two fundamentally different factors of dust formation in hammer crushers were found: (1) free-impact dust formation, and (2) dust formation resulting from abrasion as groups of particles slid across the working face of the hammer. The amount of dust formed by abrasion depended on the amount of dust in the starting mixture, and that formed by free impact was proportional to the linear speed of the hammers.

14286

Pakter, M. K., D. P. Dubrovskaya, A. V. Pershin, and G. K. Talalaev

MERCURY IN CARBONIZATION BY-PRODUCTS. Coke Chem. (USSR) (English transl.), no. 11:41-44, 1968. 7 refs.

The mercury content of various carbonization products from Soviet coke and Chemical works was checked. Mercury was present in the precipitates from tar and tar liquor, predominately in the form of sulfides. The tar contained approximately 40% of the mercuric sulfide. When the tar was rectified, about 40% of the mercury was released in metallic form. Under appropriate cooling conditions, it is liberated in the condensing apparatus. The remainder of the tar mercury contained mainly anthracene, oil, and pitch. Nearly all the mercury was distilled off when hard pitch was produced. It was established that mercury collects in significant quantities only in coal tar, in certain precipitates, and in sulfuric acid tar. (Author conclusions modified)

14767

Markus, G. A., Yu. G. Ozerskii, and V. I. Oratovskii

DISCHARGES TO ATMOSPHERE AT THE PHENOL WORKS. Coke Chem. (USSR) (English tanslation from Russian of: Koks i Khim.); no. 1:37-39, 1969. 9 refs.

The quantity and composition of discharges from the phenol works were determined. Discharges come from breather valves in operational equipment as a result of evaporation from equipment operating under a vacuum which discharges drawn-off gases, and from spent gas leaving the unit for springing sodium phenolates with carbon dioxide. The vacuum pump discharges contain hydrogen sulfide and ammonia. Impurities such as pyridine bases, phenols, neutral aromatic hydrocarbons, hydrogen sulfide, and ammonia enter the common collector. Measurements revealed that the volume of the gas-air mixture discharged to the atmosphere through the collector is 600-800 cu m/hr. Two- liter samples were taken over a 30-min period and analyzed. The fluctuations of the various contents were ascribed to changes in the composition of the raw materials that were processed and in the operating conditions of the plants. The maximum concentrations of the noxious discharges were calculated. The results indicated that the content of phenols, hydrogen sulfide, and other impurities exceeded the maximum standards and must be reduced 10-20 times. It was concluded that work should be done to reduce the volume of discharge by strict observance of the process conditions to ensure that minimum discharges and effective equipment be developed to trap noxious impurities.

15455

Stebliy, K. T., N. A. Panasenko, A. Z. Tsypin, and Yu. D. Timofeyev

EXPERIENCE OF A PLANT IN COPING WITH SULFUR REMOVAL. (Opyt osvoyeniya tsekha seroochistki). Text in Russian. Koks i Khim., no. 7:36-39, 1967.

Within three months it was discovered that installations at the Krivorozhsk Metallurgical Factory had reached their maximum

capacity for sulfur removal in the production of sulfuric acid. Modifications to the system, required to cope with increased production requirements, are described. These modifications include the use of larger pumps, better-quality pipes, improved irrigation of scrubbers, etc. Despite a 12-13% increase in acid yield, a 4 g/cu m loss of H2S to the feedback gases indicates need for higher design capacities to allow for the H2S content of the coke gas.

16125

Masek, V.

DEPOSITION OF COAL AND PITCH DUST ON AND AROUND COKE OVENS. Coke Chem. (USSR) (English translation from Russian of: Kaks i Khim.), vol. 4:29-31, 1969.

The results of investigations on the amounts of dust, the composition, and the method of dissemination in pitch-coke batteries and coke oven batteries was described. Most of the dust deposited on the pitch-coke batteries was in the form of spherical particles with a minimum diameter of 0.3-0.5 micron. The majority of the dust particles which settled on coke-oven batteries had a characteristic crystalline structure. Samples of dust deposited on the top of and in the vicinity of five coke-oven batteries were analyzed. No striking differences were obtained under winter and summer conditions. Homogeneous samples were collected to determine the contents of vitrain, clarain, durain, fusain, coke, and other constituents. It was established that the major component is vitrain. Results showed that with increasing distance from the battery, the deposits contain larger proportions of particles below 0.2 mm and smaller amounts of 3,4-benzopyrene. The highest content of 3,4-benzopyrene was found in the pitch and dust on and around coke-oven batteries. The amount of dust deposited on the coke-oven batteries depends on the charging procedure. Observations showed that ramming reduces dust emissions and loose charging increases the emissions. The results support the conclusion that strict adherence to battery operating instructions secures a major reduction in dust pollution. A further improvement can be effected by adopting the smokeless charging technique.

17583

Sellars, J. H., Hornsby-Smith, M. P., M. R. Meades, and G. E. C. Randell

COKE-OVEN TECHNOLOGY. Coke Gas, vol. 23:411-420, Oct. 1961. 2 refs.

One of the three primary sources of smoke emissions in the coke-oven industry is the charging operation. In view of considerable differences of opinion regarding the effectiveness of different charging methods, 200 different charging operations were observed at seven plants. The effects of oven construction, coal characteristics, charging period, coal running period, and levelling period on charging emissions were noted. A Mass Emission Factor (M.E.F.), e.g., the total amount of smoke emitted, was employed to distinguish quantitatively between operational procedures and methods used at the various plants. Low M.E.F. values were due to a combination of factors, such as the use of a rotating chamber for controlled feeding and sequential hydraulic operation of the conventional charging car. The chief conclusion of the survey was the need for adequate suction in the gas space. This can be achieved efficiently and inexpensively by means of the breeches pipe. However, even with improved suction, smokelessness cannot be guaranteed with normal charging methods. The prerequisites for this procedure in which a steam jet in the ascension pipe is used to draw smoke into a gas-collecting main are as follows: adequate pull; adjustment of charging rate in accordance with the pull; means for gas extraction at both ends of the oven chamber; a method of loading the ovens so that a free space exists to each gas offtake; and means for restricting the leveller bar to prevent undue admission of air. In the future, this type of charging should be the normal practice.

19209

Masek, Vaclav and Josef Sedlak

EXHALATIONS OF COKE OVEN PLANTS. (Exhalace z koksoven). Text in Czech. Hutnicke Listy (Prague), 25(3):149-153, 1970. 10 refs.

The total emissions escaping from all Czechoslovak coke oven plants in 1968 was 54 thousand tons; half of it was emitted through chimneys and half represented ground pollution. Thus, 5.5 mg kg of emissions was exhaled per 1 ton of coke produced. The dust content in the coke oven plants atmosphere is often higher than the allowed limit and contains carcinogenic aromatic compounds. The emissions by metallurgic coke oven plants (two fluids of all country coke oven plants) reached 36,500 tons in 1968. The major technological steps to solve this unsatisfactory situation are seen in improvement of design of the retorts (their charging, more effective thermal insulation of their top floor, gas desulphurization, etc.). By 1980 this would result in 80% decrease of total emissions. With the contribution of new production based on otherwise wasted emissions, the investment would return within 5 years.

21429

Ohme, W. and Weskamp

REDUCTION OF EMISSIONS IN COKING PLANTS. (Emissionsverminderung in Kokereianlagen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:243-251, 1970. 11 refs.

The sulfur containing waste gases developing in coking plants are usually drawn off at the point of origin so that none of these gases can escape into the atmosphere. Certain amounts of sulfur dioxide and sulfur trioxide do escape, however, at the sulfuric acid production stage. Treatment of hydrogen sulfide containing gases is exclusively limited to wet catalytic methods. The SO3 emission in new plants may not exceed 2 kg/ton of sulfuric acid. In the coke sifting and pulverization station of coking plants, dust is produced. The dust-laden air is usually drawn off and cleaned in cyclones and scrubbers. Dust emission by coking plants has been limited to 150 mg/cu m. Coke particles are carried along by the fumes developing at the quenching process of glowing coke, Injection of water into these fumes reduces the particulate matter by one third. More recently, baffles installed in the quenching towers are used for retaining these particles. The gases developing at the charging process are drawn off and cleaned in a subsequent scrubber. Discharge of the coke from the coke oven causes the highest emissions. Two separate wet collectors are used for collecting the dust from discharging of the coke from the chamber and for collecting the dusts from the dust fan above the quenching cart. The collectors are installed on the coke mass cart. Developmental work is still in process to further improve this cleaning process.

22504

Telling, Hermann

AIR POLLUTION CAUSED BY COKING PLANTS AND GASWORKS. (Luftverunreinigung durch Kokereien und Gaswerke). Text in German. Energietechnik, 17(12):556-559, Dec. 1967. 11 refs.

Solid and gaseous pollutants emitted by coking plants and gasworks, existing possibilities of reducing their emission, analytical methods available for their identification, and regulations governing air pollution are discussed. Ninety percent of the emission from anthracite coking plants originates in the furnace and slaking plants which generate coal and coke dust, aromatic hydrocarbons, and combustible and toxic gases like carbon monoxide, hydrogen sulfide, sulfur dioxide, and ammonia. Emissions from these plants vary widely, depending on technological factors, throughput, competence of operators, and quality of coke produced. Dust generation can be reduced by proper handling of coal, like sprinkling with water during unloading. The emission of pollutants during filling of the chambers can be reduced by a reduction of the filling time through the use of proper equipment and further reduced by combustion or purification. At best, the gaseous pollutants can thus be reduced by 60%. The best equipment for pollution control in coking plants was developed by the Koppers Co. Instruments available for the determination of dust pollution levels include the konimeter, Gast's dust balance, and the tyndalloscope; gaseous pollutants are determined by methods based on absorption of radiation, changes of conductivity, principles of colorimetry, and gas chromatography. The highest median monthly permissible dust precipitation is 15 g per sq m. The financial outlay for pollution equipment comes to approximately 10% of the initial investment in the plant.

24195

Zaichenko, V. M., V. M. Petropolskaya, M. B. Khvat, V. I. Melinkentsova, A. A. Karyukin, and N. V. Zadoroshnaya

HYDROGEN CYANIDE IN COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim, no. 10:52-54, 1969.

One of the forms in which nitrogen is found in coke-oven gas is a hydrogen cyanide. A hydrogen cyanide balance sheet is presented for a 4-battery plant with large ovens and a gas throughput of 125 thousand cu m/h. The flowsheet considered includes the following stages: primary coke-oven gas cooling (in horizontal- tube coolers); ammonia recovery (in saturators or by the evaporativ processes); final cooling; recovery of benzole hydrocarbons with coal tar wash oil; and removal of hydrogen sulfide by the vacuum-carbonate process. Analysis of the sheets shows that hydrogen cyanide is a nuisance in almost every stage of the recovery and sulfur removal processes. Its most serious effects are atmospheric pollution, equipment corrosion, loss of product quality, and increased consumption of sulfur removal reagents. The only way to overcome these difficulties is to remove the hydrogen cyanide before the gas enters the saturator or final gas cooler, i.e., at the point where the hydrogen cyanide content of the gas is at a maximum.

25214

Kutuzova, L. N., A. F. Kononenko, and Z. G. Sashevskaya

COMPOSITION OF DISCHARGES FROM COOLING TOWERS FOR TERMINAL COOLING OF COKE-OVEN GAS. (Sostav vybrosov iz gradiren konechnogo okhlazhdeniya koksofogo gaza). Text in Russian. Koks i Khim., no. 7:47-49, 1970. 4 refs.

A study was made of the concentrations and quantities of harmful impurities discharged by cooling towers of the Zaporozhsk By-Product Coke Plant. Emissions into the atmosphere were established as follows (mg/cu m): hydrogen sulfide, 28-57; hydrocyanic acid, 139-242; ammonia, 20-28; pyridine, 12-28; naphthalene, 0.8-2.15; phenol, 4.5-6.4; hydrocarbons, 78-185, and; carbon disulfide, 13.5-26.9 (air flow rate, 197-220 thousand cu m/hr). Gaseous emission rates were found to be as follows (kg/h: hydrocarbons, 24.4; H2S, 7.39; HCN, 7.39; C6H6OH, 1.15; pyridine, C10H8, 0.36; CS2, 3.84; and NH3, 4.75. Analogous data are also given for water discharges.

25215

Kolyandr, L. Ya. and I. A. Fayda

SULFUR COMPOUNDS IN RAW BENZENE OF COKE-CHEMICAL PLANTS OF THE SOUTH. (Sernistyye soyedineniya syrykh benzolov koksokhimicheskikh zavodov Yuga). Text in Russian. Koks i Khim., no. 9:36-38, 1970. 6 refs.

Head fractions, benzene, toluene, xylene, and heavy benzene fractions produced at the Zhadanovsk By-Product Coke Plant were analyzed for total sulfur content, as well as sulfur in the form of carbon disulfide and thiophene. The head fraction (up to 78 C) contained 33.2% total sulfur, 32.5% carbon disulfide, and 0.04% thiophene. Corresponding values for the other fractions were 0.59-0.62%, 0.01% (benzene fraction only), and 0.56-0.60%, respectively. It has been established that the average relative sulfur content in raw benzene produced in by-product coke plants in the South in 1965 was 123.7% as compared to 100.0% for 1955; the increase resulted from a 4.4% increase in batch sulfur content. Thiophene content of raw benzene currently ranges as high as 1.5% and is expected to reach close to 2% in the near future. Special efforts to deal with this problem are urged.

26314

Kutuzova, L. N., A. F. Kononenko, and G. P. Sokul'skiy

COMPOSITION OF INDUSTRIAL EMISSIONS OF A BENZENE RECTIFICATION INSTALLATION. (Sostav promyshlennykh vybrosov tsekha rektifikats benzola). Text in Russian. Koks i Khim., no. 8:42-44, 1970. 6 refs.

Aerodynamic losses from a standard petroleum-products storage tank were established at about 2.5 tons per year, while total emission of harmful substances (benzene hydrocarbons, hydrogen sulfide, carbon disulfide, phenols, and cyanides) from the fractionation facilities of the Zaporozhsk Coal-Tar Chemical Plant was estimated to be about 1500 tons per year. Losses at various stages of the fractionation process were measured, and results are tabulated.

26441

Oglesby, Sabert, Jr. and Grady B. Nichols

A MANUAL OF ELECTROSTATIC PRECIPITATOR TECHNOLOGY. PART II -- APPLICATION AREAS. Southern Research Inst., Birmingham, Ala., NAPCA Contract CPA 22-69-73, 875p., Aug. 25, 1970. 118 refs. NTIS: PB 196381

The application of electrostatic precipitators is reviewed for the electric utility industry, the pulp and paper industry, the iron and steel industry, the rock products industry, the chemical industry, in cleaning municipal incinerator dusts, for the petroleum industry, and in the nonferrous metals industry. Particular emphasis is placed on the dust and gaseous emissions of the processes discussed. This is followed by a tabulation of input and design parameters for precipitators operating on various types of dust control problems and an analysis of critical design parameters and test results. Cost data are also presented. The electrolytic reduction of aluminum, the production of copper, primary lead, and zinc reduction are discussed in the area of the nonferrous metals industry. In the petroleum industry, catalytic cracking and detarring are indicated as application areas. Refuse properties are discussed, as well as

types of incinerators. Sulfuric acid production, the production of elemental phosphorus, phosphoric acid, and carbon black, warrant the use of precipitators in the chemical industry. In the rock products industry, the manufacture of Portland cement and the gypsum industry present problems. Coke ovens, sinter plants, blast furnaces, open hearth furnaces, basic oxygen converters, electric arc furnaces, scarfing machines, and iron cupolas are areas of application in the iron and steel industry. In the pulp and paper industry, precipitators are indicated for the recovery of boiler particulate emissions and sulfate process flue gases. Fly ash precipitators are needed in the electric utility industry.

27900

Smith, William M.

EVALUATION OF COKE OVEN EMISSIONS. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1970. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-94.)

The composition and effects of coke oven emissions are evaluated. The polynuclear aromatic content of coke oven volatiles is determined by placing the sampling unit near the larry car. Unsubstituted polynuclear aromatics constitute between 2-3% of the collected volatiles or between 4-6% of the benzene soluble portion of the collected volatiles emitted during the charging operation. The investigation of different types of control equipment installed at various coke oven plants in the Ruhr valley showed that the fume control equipment on the larry car was not operable a significant part of the time; when the equipment was working satisfactorily, employee exposures were less than with the uncontrolled larry cars. Studies were also conducted to determine the most non-powered, half-mask respirator for use in reducing the exposure to coal tar pitch volatiles. Mechanical-filter respirators were more effective than the chemical-cartridge respirators. Further research on the characterization of coke plants emissions included the development of a more refined method to permit the quantitative measurement of 4 and 5-ring polynuclear aromatic hydrocarbons, the determination of polynuclear aromatic hydrocarbons and composition of coal tar pitch volatiles at a number of widely scattered coke plants, and the determination of the polynuclear aromatic hydrocarbon content of samples taken at various distances from coke oven batteries.

28641

Medvedev, K. P. and V. M. Petropolskaya

FACTORS DETERMINING THE AMOUNT AND COMPOSITION OF ORGANIC SULPHUR COMPOUNDS IN COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim., no. 7:32-35, 1970. 1 ref.

A study of the basic factors responsible for the total organic sulfur contents of raw and return coke-oven gases showed that free-space temperature is the most significant influence on the organic sulfur content of raw coke-oven gas. The lowest recorded value (757 C) corresponded to the lowest organic sulfur content, and the highest values (797-806 C) to the highest contents. The next most important factor is the volatile yield of the charge; as it increases from 25.5 to 26.6%, only 1.1%, the organic sulfur content of the raw gas goes from 535 to 903-943 mg/cu m. The organic sulfur content of the return coke-oven gas depends on the original amount in the raw gas and the condensation and recovery techniques applied. By simultaneously lowering the temperatures of cooling towers and increasing wash oil circulation rates, it is possible to reduce the organic sulfur in the return gas to 300-350 mg/cu m. The residual organic sulfur content can be reduced to 160-260 mg/cu m by compressing the return gas at 18-20 atm.

29627

Grosick, H. A.

AMMONIA DISPOSAL--COKE PLANTS. Blast Furn. Steel Plant, 59(4): 217-221, April 1971. 1 ref. (Presented at the Western States Blast Furnace and Coke Plant Association Meeting, Chicago, Ill., Jan. 29, 1971 and at the Eastern States Blast Furnace and Coke Oven Association Meeting, Pittsburgh, Pa., Feb. 19, 1971.)

The system of ammonia destruction proposed in 1958 as an alternate to sulfate production consisted of washing thee ammonia from the coke oven gas by means of water, distilling the ammonia from the water, dephlegmating the vapors to a concentration which could be burned, incineration of the vapors in a combustion furnace and venting of the products of combustion to the atmosphere by means of a stack. Certain variations are proposed as a direct result of the increased stringency of air and water pollution regulations, and in order to minimize operating difficulties and reduce initial investment and operating costs. It is recommended that the gas outlet temperature from the primary coolers by held as low as possible to minimize the amount of naphthalene remaining in the gas. It is also important that the efficiency of tar removal be maintained at a high level to minimize tar deposition in the naphthalene scrubbing system. Operation of the naphthalene scrubber without gas cooling appears to be less troublesome and less expensive than with cooling since there is little condensate to be separated from the oil and the heat transfer surface required for oil cooling is much greater than that required for water cooling in the first stage of the ammonia washer. Other variations are also cited which pertain to the ammonia washers and benzol washers. Critical operating conditions are mentioned, and pollution problems associated with ammonia destruction are discussed. Of the acid gases removed, hydrogen sulfide is of particular importance since all of the hydrogen sulfide absorbed with the ammonia will be distilled from the scrubber liquor with the ammonia vapor and burned in the combustion furnace to sulfur dioxide. Many potential customers have been concerned that the combustion of ammonia might produce an inordinantly high quantity of oxides of nitrogen. Stream pollution associated with the crude ammonia liquor and its control are also discussed.

29781

Gils, Walter

MARKET DEVELOPMENT IN GAS ECONOMY. (Die Marktentwicklung in der Gaswirtschaft). Text in German. Gas Wasserfach Gas Erdgas (Munich), 112(5):215-219, May 1971. (Presented at the Gasfachlichen Aussprachetagung, Wuerzburg, West Germany, 1970.)

The natural gas consumption in West Germany in 1969 was 22.7 billion cu m/4300 kcal/cu m, an increase over the previous year of 42%. The gas supply from coking plants, remote gas supply companies, and local gas works has doubled over the past ten years. Natural gas is widely used in households and industry. Since gas heating does not contribute to air pollution, it is gaining popularity rapidly. Natural gas is also used in remote heating plants, houses, and industry (boiler plants, production plants in the cement and potassium industry, and power plants). Another further application is the total energy obtained when power is produced with the aid of a gas turbine or gas motor and where the waste heat is used for the drying processes.

30026

Kutuzova, L. N., V. D. Sulima, V. N. Kutuzov, and P. L. Saltan

DECONTAMINATION OF POLLUTED AIR FROM HARD PITCH PRODUCTION PLANT. Coke Chem. USSR (English translation from Russian of: Koks i Khem.), no. 10:49-51, 1970

Polluted air from a pitch preparation plant was passed through a water cooler and a 100-liter trap, where it was bubbled through a layer of condensate to remove the aerosol and moisture. From the trap, the air entered a 24-liter catalytic reactor for oxidation of the residual pollutants. All catalysts investigated (bauxite, iron oxide, copper-chromium oxide) oxidized tarry matter quite effectively, including its polycyclic aromatic hydrocarbons. In addition to reducing the residual tarry matter to a few mg/cu m, the catalytic reactor lowered the waste gas temperature to 400-600 C. At these temperatures, the risk of synthesizing the carcinogenic hydrocarbons is avoided.

36379

Roussel, A. A. and H. Stephany

CONTINENTAL REPORT: EUROPE. International Union of Air Pollution Prevention Associations, Intern. Clean Air Congr., Proc. London, England, 1966, p. 29-34. (Oct. 4-7, Paper II/6.)

The problem of air pollution in Europe is reviewed with respect to emission sources, geographical and population factors, specific pollutants, research programs, and legislation. Major emission sources include industrial plants, power stations, iron works, metallurgical plants, coke oven plants, petroleum refineries, cement plants, chemical processing, domestic heating, and motor traffic. The most important emissions include dusts, fumes, sulfur dioxide, soot, and carbon monoxide. Air pollution control legislation is reviewed for Germany, Britain. Belgium, the Netherlands, Italy, and France.

37713

Masek, Vaclav

NEW FINDINGS CONCERNING THE PROPERTIES OF FLY DUST FROM COKING PLANTS. PART I: PHYSICAL-CHEMICAL PROPERTIES. (Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil I: Physikalisch-chemische Eigenschaften). Text in German. Zbl. Arbeitsmed., 22(2):38-47, Feb. 1972. 20 refs.

With every ton of coke that is produced, 0.5 to 2.0 kg fly ash are obtained as a waste product. The properties of this fly dust were studied on three samples taken in summer 1970 from the NHKG- coking plant in Ostrava-Kunice. The sorption properties were examined at temperatures between 22 to 20 C after boiling the dust sample is distilled water at a pressure of 100 to 150 mm Hg and withdrawing the water afterwards. The ion exchange capacity of the dusts was determined by conductometry according to Sandhoff. Furthermore the electrokinetic potentials, the magnitude of adsorption of several gases and vapors, the catalytic properties, and the crystalline quartz modification was determined. The sorption properties of the dust in most cases did not reach the capacity of ordinary filtering paper. They also have a relatively low exchange capacity in particular for sodium, potassium, and ammonia. The electrokinetic potentials of the particles are positive, however, and rather low. Like the sorption properties the adsorption capacity for gases and vapors is very low. At the dissociating hydrogen peroxide reaction, the contact catalytic properties of all dust samples were rather weak. The fly dust had very little activity.

38526

Thoenes, Hans Willi and Wolfgang Guse

CARBON MONOXIDE EMISSION IN INDUSTRIAL AREAS. (Kohlenmonoxid-Emissionen aus Industriebetrieben). Text in German. Staub, Reinhaltung Luft, 32(2):50-52, Feb. 1972. 3 refs.

The carbon monoxide emission by steam boilers, cupola furnaces, the chemical and petrochemical industry, and coking plants is discussed. The Federal Republic of Germany has 1800 cupola furnaces which emit considerable amounts of CO. For instance, as continuous and discontinuous measurements showed, a cupola furnace with a nominal capacity of 15 tons/hr produces 20,000 cu m waste gas/hr of which 4% by vol (982 kg/hr) are CO. An observation of the firing process revealed that the CO concentration decreased drastically whenever overhead firing occurred during charging. In the chemical industry CO emissions occur when the gas pipes are leaky or at cleaning or scrubbing processes of the organic products for which CO was used, e.g., methanol or formaldehyde. According to U. S. statistics, 50 g CO are emitted/kg formaldehyde produced. In coking plants CO is emitted during the charging of the furnace. Measurements revealed that concentrations of more than 5.4% by vol are not emitted longer than 1 min.

38657

Fuhrmann, N.

PROBLEMS OF ENVIRONMENTAL PROTECTION IN BASIC-INDUSTRY PROCESSING PLANTS. (Probleme des Umweltschutzes bei verfahrenstechnischen Anlagen der Grundstoffindustrie unter besonderer Berueecksichtigung gesetzlicher Vorschriften zur Luftreinhaltung und Laermbekaempfung). Text in German. Aufbereitungs-Technik, 12(12):757-763, Dec. 1971. 25 refs.

Branches of industries such as cement plants, soft and hard coal briquetting plants, cokeries, and iron ore sintering plants are large air polluters. Great efforts have been undertaken to reduce emission. In the cement industry, for instance, the average dust emission dropped from about 3.5% in the year 1950 to 0.15% of the clinker production in 1967. Over the same period the clinker production rose from 11 million tons to 33 million tons. The technical directives limit the dust emissions by cement grinding stations to 150 mg/cu m. The gaseous emissions from cement plants are negligible. The soft coal briquetting plants of the German Democratic Republic emitted about 260,000 tons of dust in 1967. In hard coal briquetting plants the emission of benzo-3,4-pyrene must be mentioned in addition to the dust emission. Cokeries emit dusts, tar aerosols, and gases, particularly hydrogen sulfide and sulfur dioxide. In 1956 the SO2 emission by these plants amounted to 56,000 tons. Through scavenging of the gases, the SO2 emissions can be greatly reduced. In iron ore sintering plants, dust and SO2 are emitted. The SO2 concentration in the uncleaned gas may reach 10 g/cu m. At an annual production of 20 million tons of sinter, about 210,000 tons of SO2 are emitted. These plants also emit fluorine. The federal government drafted a law expanding its constitutional rights to include the fields of water pollution, maintenance of clean air, and noise abatement. Emission limits for basic industry processing plants are included in the technical directives pertaining to air.

40159

Brandt, A. D. and D. M. Anderson

MEASURES AGAINST AIR POLLUTION CAUSED BY INDUSTRIAL SOURCES. (De strijd tegen de luchtvervuiling afkomstig van industriele bronnen). Text in Dutch. Polytech.

Tijdschr., Ed. Procestechniek (The Hague), 27(7):231-237, 1972. 26 refs. (Presented at the Environmental Control Seminar, Rotterdam, Netherlands, May 25-26, 1971).

A general survey is given of air pollution from industrial sources in the United States, with special regard to particulate, gaseous, and fluorine pollution. The contribution of industry to air pollution was 14% with 30 million tons in 1968. Particulate pollutants are most important, followed by sulfur dioxide, hydrocarbons, carbon monoxide, and gaseous and particulate fluorine compounds. To effectively control air pollution, improved source localization techniques are required. General principles and uses of pollution control equipment such as cyclones, tissue filters, scurbbers, and electrostatic filters are reviewed. Contributions of several industries to particulate and gaseous pollution in 1967 are reviewed. Quarrying, gravel, and sand processing was the major source of particulate emissions with 4.6 million tons, followed by grain mills with 2.952 million tons. Compared to other industries, a high proportion of the emission sources is localized in the iron and steel industry, (1.490 million tons). Cokeries are a major source of HC emissions. The respective contributions by the paper and asphalt industries were 633,000 and 522,000 tons. The joint share of the cement and lime industries is 744,000 tons, followed by foundries with 217,000 tons. Brick manufacturing was responsible for the bulk of fluorine emissions. The chief sources of sulfur dioxide, carbon monoxide, and hydrocarbon emissions were primary nonferrous smelting (2,940,000 tons from the copper industry alone), petroleum refining (6.2 million tons), and petroleum products processing (1.1 million tons), respectively.

40340

Mallette, Frederick, S.

A NEW FRONTIER: AIR POLLUTION CONTROL. Proc. Inst. Mech. Engrs. (London), 1954:595-615, April 9, 1954. 60 refs.

Areas in the United States and Canada where definite accomplishment of significant developments were made in air pollution control are discussed. Legislative developments which brought about reduced air pollution are presented. Model ordinances include those in St. Louis, Mo., Pittsburgh, Pa., New York City, and Los Angeles County, Calif. The influence of meteorological factors upon the dispersion or accumulation of air pollutants is apparent, but an understanding of the fundamental factors, other than wind, is just being reached. Temperature, lapse rates, stability, and smog influence pollution. The highlights of the Donora, Pa. smog of 1948 are presented. A description of the control procedures and equipment presently in use there are given, together with a statistical analysis of the air sampling and meteorological data which is collected. The development of instrumental methods and socio-ecomonic aspects are also discussed. Problems of the iron and steel industry include emissions from coke ovens, blast furnaces, open hearth furnaces, bessemer converters, and electric furnaces. Power production, chemical processing, and the rubber industry also cause pollution.

41877

Herrick, R. A.

BACKGROUND INFORMATION FOR ESTABLISHMENT OF NATIONAL STANDARDS OF PERFORMANCE FOR NEW SOURCES: IRON AND STEEL INDUSTRY. Environmental Engineering, Inc., Gainesville, Fla., and Herrick Associates, Reston, Va., Environmental Protection Agency, Division of Abatement Contract CPA-70-142, 107p., March 8, 1971. 40 refs.

Process conditions common in iron and steelmaking are outlined. Emissions of particulates, sulfur oxides, nitrogen oxides, fluorides, polycyclic organic matter, total reduced sulfur, odors, carbon monoxide, and visible emissions are discussed for the processes and the optimum control devices are identified where possible. The basic oxygen furnace and the electric furnace are expected to become the only significant factors in steel production over the next 20 years. There are no BOF installations in the U. S. that do not have air pollution control devices. Control in electric furnace steelmaking is usually handled by canopy heads and sometimes by roof evacuation. The gases from both processes are usually conducted to gas cleaning systems. Recommended standards of performance for the BOF can be written in terms of particulate emissions. A concentration no greater than 0.020 grs/scf should be the maximum. Gas cleaning installations cannot in most cases maintain acceptance specifications. Electric furnace steelmaking should be restricted to a standard of one lb/t of steel produced.

43346

Parker, Albert

ESTIMATES OF AIR POLLUTION IN THE UNITED KINGDOM IN THE YEAR 1970- 71. Clean Air, 1(6):18-19, 1972. 1 ref.

Energy generation and smoke and sulfur oxide emission from fuel combustion and emissions of carbon monoxide, hydrocarbons, aldehydes, nitrogen oxides, and SOx from petrol and diesel engines are estimated and tabulated for the United Kingdom in 1970-1971. Smoke and SOx concentrations generated by combustion of coal for fuel in domestic heating, railways, coal mining, electric power stations, coke ovens, the gas supply industry, carbonization plants, and fuel plants equaled 0.72 and 3.40 million metric tons, respectively. Coke combustion for domestic and industrial sources contributed 0.17 million metric ton of SOx. The use of oil for power sources in domestic, industrial, and commercial sources, the gas supply industry, road transport, railways, and marine craft resulted in emissions of 6.07 million metric tons of SOx. Equivalents for hydro-electricity, nuclear power generation, and natural gas are included. Petrol and diesel engines, respectively, emitted 6.7 and 0.11 million tons of CO; 0.34 and 0.021 million tons of hydrocarbons; 0.01 and 0.003 million tons of aldehydes; 0.23 and 0.07 million tons of NOx; and 0.025 and 0.04 million tons of SOx. The amount of lead in the compounds discharged in exhaust gases from petrol engines was estimated at about 6000 tons.

44028

Bhattacharya, R. N. and P. Bhattacharya

ANALYSIS OF COKE OVEN GAS BY VAPOUR PHASE CHROMATOGRAPHY. Indian J. Technol. (India), 9(6):219-223, June 1971. 11 refs.

A simple, rapid, and accurate method for the analysis of gas obtained during the carbonization of coal is described. Coke oven gas consists primarily of hydrogen, methane, carbon dioxide, carbon monoxide, ethane, propane, and various olefins. Complete analysis of the individual components present in the sample is done by a combination of gas-solid and gas-liquid chromatographic techniques employing different columns, e.g., alumina, dinonylphthalate, and beta, beta-oxydipropionitrile. Quantitative data on typical gas samples obtained from test runs carried out in pilot plants are presented. Details of the procedure adopted for the collection of samples and preparation of the stationary phases and column packing are given. (Author abstract modified)

45461

Smith, William M.

EVALUATION OF COKE OVEN EMISSIONS. J. Occup. Med., 13(2):69-74, Feb. 1971. 1 ref. (Presented at the American Iron and Steel Institute, General Meeting, 78th, May 28, 1970.)

In 1965 the American Conference of Governmental Industrial Hygienists adopted a tentative threshold limit value for employee exposures to the benzene-soluble fraction of coal tar pitch volatiles. Comparison of glass fiber, cellulose acetate membrane, and silver membrane filters for the collection and measurement of the benzene-soluble fraction, made by the State of Pennsylvania, established that silver membrane filters were most effective. The sampler and methods of collection and analysis are described. An American Iron and Steel Institute research program evaluated the efficiency of silver membrane filters, and an attempt was made to determine the composition of the benzene-soluble fraction with particular emphasis on polynuclear aromatics. A six-man survey team was organized by AISI to go to Germany to investigate the effectiveness of the different types of control equipment installed at various coke plants in the Ruhr Valley. An accelerated respiratory protection program is described, and results are given of extended research on the characterization of coke plant emissions. The design and testing of a powered air purifying respirator for coke oven workers are considered, as well as the criteria for the threshold limit value for coke oven emission.

46920

Masek, Vaclav

NEW FINDINGS CONCERNING THE PROPERTIES OF FLY DUST FROM COKING PLANTS. III. PITCH COKING. (Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil III. Pechkokerei). Text in German. Zbl. Arbeitsmed., 22(9):276-281, 1972. 11 refs.

Fly dust samples from the vicinity of a pitch coking plant were used for determination of the current potential, the contact-catalytic influence on the hydrogen peroxide-dissociation, the sorption properties of original, hydrolyzed, and aged dusts, the gas vapor adsorption, the importance as a nutritive substance for plants, the influence on the inversion of sucrose by invertase, and the radioactivity. For determination of the current potential a standard chloride solution was prepared with which the dust samples remained in contact for three days. For the three samples, current potentials of plus 4 mV, plus 3 mV and minus 4mV were calculated. All samples were rather inactive catalytically primarily the sample from the upper part of the block. The original, hydrolyzed, and aged fly dust samples all had rather low sorption properties. The nutritive substances contained in the fly dust samples were liberated to a minor extent only in aqueous solutions. None of the dust samples influenced the enzymatic reaction of sucrose inversion by invertase. Thus the dusts found in the vicinity of pitch coking plants must indeed be counted as undesirable components of the atmosphere.

48279

Pitt, R. S.

STEELMAKING AT PORT KEMBLA. Iron Steel, 45(5):527-534, 535-540, Oct. 1972.

The Port Kembla steelworkers in Australia are discussed. The development of the steel industry in Australia, the growth of steel consumption, and the layout of the plants are reviewed. The steelworks complex consists of sinter plants, coke oven batteries, blast furnaces, open hearth and electric steelmaking shops, an ingot mould foundry, plate an/ hot strip mills, and a steel strapping line. The operation and cooling of the furnaces is described. A tar and naphthalene recovery plant, gas cleaning systems including dust catchers and wet scrubbers for the furnaces, rolling and finishing services, plate finishing and tinplate production, and personnel training are reviewed. The Port Kembla Works are in the process of expansion, having already increased the steelmaking capacity by the addition of new blast furnaces, a basic oxygen plant, and rolling and finishing services. Costs of installing the new facilities are reviewed.

48336

Enik, G. I., T. I. Markina, and I. L. Vangnits

SIFTINGS OF STAVROPOLIC COALS AS RAW MATERIAL USED TO PRODUCE SMOKELESS FUEL. (Otsevy stavropol skikh ugley kak syr ye dlya polucheniya bezdymnogo topliva). Text in Russian. Tr. Inst. Goryuch. Iskop., Moscow, 26(1):68-73, 1971. 9 refs.

A new cokery was designed for the conversion of siftings from Stavropol coals into smokeless coke by applying a continuous coking process with oxidative pyrolysis. The siftings, with 40-70% below 13 mm, contained 17-32% of ash and 37-43% of volatiles. Siftings from different mines were mixed to secure good agglomeration and sufficient strength of the coke. Coking was done in a temperature range of 600-700 C. The thickness of the plastic layer was 6-13 mm; the swelling numbers ranged from 8 to 40. The coke had a volatile content of about 0.6-11.4% and an ignition temperature of 350-380 C. The coke was in the form of 13-50 mm large particles.

B. CONTROL METHODS

01767

G. N. Lebedeva, V. S. Patrikeev, S. B. Kotlik, V. R. Shevchenko, and N. P. Pervushina

THE AMMONIA METHOD FOR REMOVING HYDROGEN SULPHIDE FROM COKE-OVEN GAS. Coke and Chem. USSR English transl. (3) 32-7, 1966.

A laboratory-scale system for the ammonia purification of coke-oven gas with a high H2S content (28g/cum) was developed. It consists of successive recovery of H2S from the gas in a cyclic process by contact with ammonia water. Ammonia was added at a rate sufficient to replenish the desulfurizing cycle. Under these conditions H2S recovery reached 97% at 20-26 C but fell to 85% at a temperature of 28-30 C. Ammonia entrainment with the acid gases was 2.5%. Calculated as percentage of the ammonia in the coke-oven gas, the ammonia entrainment with the acid gases was 10%, and thus the ammonia content of coke-oven gas was many times greater than the amount required to recover H2S.

02025

R. L. Cooper and G. W. Lee

ALLEVIATION OF AIR POLLUTION IN THE COKING INDUSTRY. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper V/1). PP. 117-9.

The problem of air pollution at coking plants is the subject of investigation by the industry, its Research Association and the Alkali Inspectorate. A method has been devised for estimating smoke emission during oven charging and used to demonstrate the effectiveness of measures adopted for its mitigation measures that include modifications of charging procedure and the use of breeches pipes for those batteries operating with single collecting mains. Grit emitted from quenching towers is minimized by installing grids or sprays and dust emitted during the handling of coal and coke is reduced by the use of sprays, hooding and dust extraction equipment. A method is being developed to assess the relative magnitude of grit and dust pollution from sources in the neighbourhood of coking plants. To enhance the industry's contribution to clean air, investigations are being conducted into the production of reactive oven cokes for the open grate and domestic boiler. (Author abstract)

02728

A. D. Brandt

CURRENT STATUS AND FUTURE PROSPECTS--STEEL INDUSTRY AIR POLLUTION CONTROL. Proc. Natl. Conf. Air Pollution, 3rd, Washington, D.C., 1966. pp. 236-41.

Air pollution control at blast furnace operations, in general, is excellent. The most important single contributor of particulate air pollutants in the steel industry today, namely, the steelmaking furnaces, is being brought under control rapidly and effectively as a result of the change in steel-making technology whereby uncontrolled conventional open hearth furnaces are being replaced by Basic Oxygen Furnace equipped during construction with adequate air pollution control facilities. The nature of the equipment and procedure currently employed in making coke for the steel industry does not permit complete control of the air pollutants created by such operations. A technological breakthrough is essential to the attainment of adequate and satisfactory air pollution control at coke-making operations. Technological improvements are needed to permit effective and practicable control of the sporadic air pollution created when high winds blow across stock piles of coal, ore and stone. The steel industry has made noteworthy progress in air pollution control in recent years and presently is engaged in a program of control which will make steel plants relatively free from major particulate air pollution problems by the end of the next decade. (Author summary)

03204

W. Ehnert.

THE BEHAVIOR OF NITRIC OXIDE DURING ELECTROSTATIC GAS PURIFICATION. Uber das Verhalten des Stickstoffmonoxids bei der elektrostatischen Gasreinigung. Brennstoff-Chem. (Essen) 9(7):273-274, Sept. 1966. Translated from German as JPRS R- 8584-D.

The effects of field intensities, ionizing-electrode diameters, period of stay of the gas in the electrostatic purifier, concentrations of nitric oxide in the gas, and the presence of unsaturated compounds upon the decomposition of nitric oxide were measured by means of an experimental electro-filter situated in coke oven plant. Within the range of 3 to 3.8 kv/cm, the quantities of NO decline with increasing field intensity, this decline amounting to only about 10 to 20% at the field strengths of 2 to 3 kv/cm which are commonly used in coke-oven installations. Industrial-economic considerations however place a limit on the extent to which voltages can be increased in practice. The period during which the gases remain in the filter is a factor in the reduction of NO content, but a doubling of this period from 6 to 12 seconds results in a maximum increase in the decomposition rate of only 25%. The reduction in NO tends first to decline and then to increase as the diameter of the ionizing electrode is increased. The most effective factor in the reduction of NO contents is the addition of unsaturated compounds; thus the addition of 2.5 ml cyclopentadiene cu/m of gas increases the loss of NO by a factor of 4 under certain experimental conditions. The experiments show that current commercial coke-oven practice results in reductions of about 20% in NO content, and that an increase in the field strengths together with a rise in the unsaturated-compound contents can effect reductions of 50-60%.

03238

A. Z. Tsypin

WASHING THE GRID PACKINGS OF SULPHUR SCRUBBERS. Coke Chem. (USSR) (English Transl.) (4) 42-5, 1966

This paper describes washing, in a plant in Krivoi Rog, the pinewood packing of sulfur scrubbers with soda solutions in four cycles with maximum g/l alkalinities of 10, 20-25, 30-35, and 50, taking 30-35 days for the complete process, the length of each cycle being determined by the change in the total content of fatty and tarry substances in the solution. Moisture,

Na2CO3 and impurities NaCl and Na2SO4 were determined in the soda being used. The foam-forming capacity of the washing solution was also determined once a day. Various impurities removed by the washing were determined at various intervals. The author suggests bringing in a working solution from outside containing working concentrations of ballast salts to wash the packing without leaching. He also suggest that a study should be made of the feasibility of using foam-breaking additives and using ballast salts in the form of an imported solution for starting up a plant.

04396

L. H. Engels

FEED GAS CLEANING IN COKE-OVEN LARRY CARS. STAUB (English Transl.) (Duesseldorf) 26, (11) 23-31, Nov. 1966. Ger. (Tr.)

The problem of feed gas cleaning in coking plants is outlined. After a description of technological processes occurring in coal carbonization, various methods for gas removal and gas cleaning are shown, and especially difficult operating conditions and the problem of output measurements to assess the efficiency of the method used are also discussed. Factors influencing the efficiency of known dust cleaning methods (size and design of ovens , type and composition of coal etc.), and the measuring results available are considered. Finally, the costs of investment, maintenance and operation are given. (Author summary)

04581

I. M. Khanin, V. I. Yakovlev, M. B. Kartsynel

A SPRAY-TYPE BENZOLE SCRUBBER WITH RADIALLY-SLOTTED GAS DISTRIBUTORS. Coke Chem. (USSR) (English Transl.) (1) 30-5, 1965. Russ. (Tr.)

The aim was to present the results of a study of the aerodynamics of a new stage-type benzole scrubber with radially- slotted gas distributors. It has been found that: 1. The radially-slotted distributors distribute the stream quite evenly across the scrubber, irrespective of how the gas is supplied (radially alpha equlas 0 degrees, along a secant alpha equal 35 degrees, or tangentially alpha equals 90 degrees); 2. Increasing the number of plates in the top and bottom rows of the distributors from 8 to 16 does not affect the distribution of the gas; 3. The gas distribution through the scrubber is impaired by increasing the depth of the slots between the two rows of plates. Although reducing the depth of the slots improves the distribution, it also increases the resistance of the scrubber; 4. The distribution of the gas improves noticeably as it passes through the distributors. There is no doubt that recovery improves as the number of distributors (and, consequently, the number of stages as well) increases; 5. Increasing the flow rate of the gas does not substantially affect the pattern of its distribution across the scrubber. However, the resultant increased turbulence of the gas jets emerging from the distributor slots improves the absorption; and 6. The resistance of a commercial stage-type scrubber with a gas throughput of 84670 cu m/h would be 53 mm water gauge. (Author conclusions modified)

04634

T. P. Varshavskii, A. M. Denisov, L. E. Zlatin, and K. V. Zolotarev

SMOKELESS CHARGING OF COKE OVENS. Coke Chem. (USSR) (English Transl.) (6) 26-31, 1965. Russ. (Tr.)

A pilot-commercial smokeless charging plant has been built on No. 1 battery at the Kemerovo Coke and Chemical Works along the lines of those at VUKhIN and the Magnitogorsk Integrated Iron and Steel Works. A new smokeless oven charging system has been devised and introduced on the No. 1 battery at the Kemerovo Coke and Chemical Works based on separate consecutive emptying of the charging-car hoppers (4,3,2 and 1) with suction of the charging gases only into the coke side collecting main. The possibility of the saleable tar being contaminated with ash or heavy tar products has been eliminated. 4.0 tons/day of high-ash tar was obtained from the coke side collecting main. The nitric oxide content of the raw gas from No. 1 battery is 16.5 cc/cu meter. Accordingly it is vital to solve the problem of how to remove the nitric oxide from the charging gases or how to isolate and utilize them without purification. The satisfactory operating results of the plant enable this system to be recommended for works which do not supply gas to nitrogenous fertilizer undertakings. (Author conclusions)

05432

A. C. Bureau and M. J. F. Olden

THE OPERATION OF THE FRODINGHAM DESULPHURISING PLANT AT EXETER. Chem. Eng., (206):CE 55-CE, Mar. 1967.

Data are presented on the operation of a desulfurizing plant for coke oven gas whose design was based on pilot plant studies. Coke oven gas was desulfurized by 16-100 mesh iron oxide in a reactor at 350-400 C. The iron sulfides formed were oxidized in a fluidized regenerator with air for reuse. The ffluent sulfur dioxide was recovered as sulfuric acid in a contact plant. The removal of hydrogen sulfide reached 99.9% with inlet concentrations of 533-640 grains per 100 cu ft. With the organic sulfur, concentrations at the inlet of 12.9-19.0 grains per 100 cu ft, the removal was 68-79% of the total. Of the organic sulfur, the thiophene removal was from 26-46%. Continuous, concurrent removal of hydrogen sulfide and the organic sulfur compounds was proved to be feasible during the operation of the plant which was closed for economic reasons. It was apparent that a redesign and simplification of the process would be necessary to obtain guaranteed continuous operation. Also, the preferred method of gas production today is based on the use of light distillate in a process which includes desulfurizing and detoxification stages without a subsidiary plant.

06576

RESTRICTING EMISSION OF HYDROGEN SULPHIDE AND OTHER SULPHUR- CONTAINING COMPOUNDS, EXCEPT SULPHUR DIOXIDE, FROM GAS GENERATORS IN COKE, GAS, AND COAL-CONSTITUENT PROCESSING PLANTS. (Gasauswurfbegrenzung Schwefelwasserstoff und andere schwefelhaltige Verbindungen ausser Schwefeldioxyd Konkereien und Gaswerke, Kohlenwertstoffbetriebe.) VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany. (VDI No. 2109.) (May 1960). 21 pp. Ger. (Tr.)

In coke and gas plants, dust, tar, mist and gas are emitted during several production stages. This VDI Specification concerns the emission of hydrogen sulphide and other sulphur containing compounds not including sulphur dioxide, by coal-constituent processing plants. The essential points treated herein are the occurrence of hydrogen sulphide and other sulphur-containing compounds not including sulphur dioxide; measures for the reduction of emissio(; and guide lines for the restriction of emission. Careful maintenance and control in operation must make sure that all equipment, lines and installations are tight. In case of operational failure, devices must exist which prevent the gases containing hydrogen sulphide from escaping

into the open air. This may be effected, for example, by reconducting such gases at a suitable point into the gas system of the coke plant. Ventilation gases existing in current operation must be prevented from constituting a risk in a similar or other manner to such an extent that the permissible immission concentration is not exceeded. During cleaning and repair, any waste-water containing hydrogen sulphide must be adequately diluted, if necessary.

06577

RESTRICTING EMISSION OF SULPHUR DIOXIDE FROM COKE OVENS AND GAS PLANTS. (Gasauswurfbegrenzung Schwefeldioxyd Kokereien und Gaswerke Koksofen (Abgase).) VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany. (VDI 2110.) 20 pp. (Aug. 1960). Ger. (Tr.).

This specification concerns the emission of sulfur dioxide with the waste gases created by the firing of the coke ovens. The essential points treated herein are the type, composition and calorific value of the different underfeed gases as well as guide values for sulfur-dioxide emission; measures for reduction of emission and low-layer concentration of sulfur dioxide; and guide lines for the restriction of sulfur-dioxide emission.

06585

RESTRICTING EMISSION OF DUST, TAR MIST AND GAS WHEN CHARGING COKE OVENS. (Auswurfbegrenzung fur Staub, Teernebel und Gase beim Fullen von Koksofen; Kokereien und Gaswerke.) VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft. Duesseldorf, Germany. VDI 2302.). 32 pp. (June 1962). Ger. (Tr.)

This specification concerns the restriction of emission of dust, tar mist, and gas when charging coke ovens with coking coal. The technology, emissions, and the reduction of escape gas emission by reconducting the escape gases into the raw gas, combustion, and scrubbing are reviewed.

06650

Kuleshov, P. J.

AERODYNAMIC INVESTIGATION OF ELECTROSTATIC PRECIPITATOR C-180 MODEL. U.S.S.R. Literature on Air Pollution and Related Occupational diseases, Translated from Russian by B. S. Levine, Vol. 7, 21-30, 1962. (Koks i Khim.) (12) 30-5, 1958. CFSTI: 62-11103

The purpose was to arrive at practical changes which might effect better gas flow distribution over the electrofilter cross section and thereby reduce its pressure drop and enhance its gas purifying efficiency. The A model was made of plastic material on 1.10 scale. Air flow through the model precipitator was created by a fan which forced through the model over 1000 cu m of air per hour. The effects of 'live' area of the lower perforated distribution screen of the inflow conduit inside location of the double T-shaped supports on gas flow distribution and on pressure drop reduction were studied. As a result of such investigation the following 2 changes have been introduced: a) the inside protuding angular downward directed part of the gas inflow condiut has been abolished; b) the original perforated gas distributing screen No. 1 which had an open area amounting to 18% of the total screen area was replaced by screen No. 2, the open area of which amounted to 28% and in some cases by screen No. 3, with an open area of 35.0%

06651

Kuleshov, P. J.

RAISING THE EFFICIENCY OF ELECTROSTATIC PRECIPITATORS, TYPE C - 140. (Koks i Khim) (4) 45-9, 1956. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Translated from Russian by B. S. Levine, Vol. 7, 30-7, 1962. CFSTI: 62-11103

A criterion for the determination of gas flow distribution over the cross section of a precipitator by a single value is described. The comparison of individual tests and the complete evaluation of their characteristics were of importance; the coefficient of uneven gas flow distribution - C.U.D., was developed to characterize the deviation in rate of gas flow from the median. Several ways of gas delivery were studied in an attempt to lessen their effect on gas flow velocity distribution. Most of the research was on appropriate perforated screen construction. Several types of distributing screens were studied; with a 'live' (perforation) areas of geometric dissimilitude. The effect of fastening the lower ends of precipitating electrodes on the productivity of the electrostatic precipitators was studied. The upper distributing screen had no effect on the distribution of the gas flow across the electrostatic precipitator, and should be removed. Removal of the gas delivery extension from inside the electrostatic precipitator reduced the pressure drop and improved the gas flow distribution. A distribution screen with a variable 'live' area (geometric dissimilitude type) and with larger openings at its periphery considerably improved the gas flow distribution. The best gas flow distribution over the electrostatic precipitator cross section was attained with a screen having a large (32%) and even 'live' (opening) section over its entire area and a ring-shaped slit at its periphery. The resistance of this screen was low, it was easily machined and its installation is recommended in all industrial electrostatic precipitators. The installation of this screen in an industrial electrostatic precipitator increased its productivity by 100% without noticeable lowering in its gas purifying efficiency. Such increases in the productivity of the electrostatic precipitators makes possible a 40% saving in equipment investment. Fastening of the precipitating electrodes onto the partition walls considerably improved the gas distribution and lowered the hydraulic resistance (pressure drop).

06652

P. J. Kuleshov

CONSTRUCTION DEFECTS IN TUBULAR ELECTROSTATIC PRECIPITATORS (ELECTROFILTERS). U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 38-44, 1962. (Koks i Khim.) (1) 43-6, 1958. Russ. (Tr.)

The construction defects in the tubular electrostatic precipitators C-140 and C-180 used in coke-chemical plants are analyzed and suggestions are made for their elimination. The defects reviewed are: insulating boxes and insulators; corona-electrodes and field tension; inoperative electrodes; gas distribution; cut-off slide gates or valves; oxygen content determination; gas load and designed production capacity.

06654

Semenov, P. A., Yu. V. Tumanov, and O. S. Chekhov

A VENTURI APPARATUS FOR AMMONIA ABSORPTION FROM COKE GAS WITHOUT AN ATOMIZER. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 47-53, 1962. (Koks i Khim.) (8) 34-7, 1960. Translated from Russian. CFSTI: 62-11103

The most advantageous way of ammonia absorption from coke by sulfuric acid by means of Venturi absorbers (minus the atomizers) is discussed. The injection liquid is carried by the gas flow itself. Mass transfer in the gaseous phase was studied by the method of water absorption of ammonia from the air-ammonia mixture. Simultaneously the pressure drop was studied in relation to the flow rate of the gas through the Venturi throat and rate of spray. Ammonia concentration was varied from 0.5 - 2.0% by volume. Velocity of air ammonia mixture in the Venturi tube throat ranged from 30.0 to 72.5 m/sec. Three types of venturi apparatus were investigated; the throat diameter in each measured 20 mm, length of throat 3 mm, and the conical diffusor angles were 8, 17 and 30 deg. With the spray rate equal in all cases and varying the gas flow rate the productivity coefficient of the three apparatuses in all instances was the same; the conical diffusor angle had no effect on the degree of ammonia absorption. The data on mass transfer obtained with experiments in water absorption of ammonia can be applied with reasonable accuracy to ammonia absorption with weak solution of sulfuric acid. Resistance in the atomizer tube falls with the increase in the conical diffusor angle suggesting that an angle of 30 degrees should be used in all types of Venturi absorbers operating at spray density exceeding 3-4 l/cu nm; this resulted in a reduced loss in pressure and smaller apparatus dimensions. Ammonia absorption from gases should not be conducted at high gas flow rates; the productivity coefficient increased to an insignificant degree whereas the pressure drop sharply rose. Ammonia absorption from coke gas by sulfuric acid is most advantageous when performed in two stages; at rate of gas flow through the Venturi throat amounting to 40.0 m/sec and rate of water spray amounting to 6 - 7 u/cu nm of acid per stage, the productivity coefficient of the entire apparatus would range between 99.0 - 99.5% at total pressure drop of 350 - 400 mm of water.

06655

Varshavsky, T. P., R. G. Agapov, F. A. Mustafin, and V. A. Permyakov

REDUCING GAS EMISSION DURING COKE OVEN CHARGING. ¼U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 56-63, 1962. (Koks i Khim.) (i) 23-30, 1956. Translated from Russian. CFSTI: 62-11103

A method for loading coke ovens by steam injectors, which might cut down air pollution to a minimum by reducing coal gas and dust escape from the hatches and risers is described. A procedure was developed for charging coke ovens equipped with single gas collecting main by unloading one bunker at a time with the other hatches closed which improved considerably working conditions on top of coke ovens. The procedure is applicable only to coke oven charging with coal of not more that 6% moisture. A new procedure for charging coke ovens with 2 gas collecting outlets by unloading the first and third bunkers first was recommended and is currently in use industrially. Coke oven charging by steam injection caused coal dust to be carried way into the gas collecting mains; therefore, the method of steam injection is not currently used in the Eastern U.S.S.R. coke-chemical plants.

06656

I. Ya. Mezentsev

SMOKELESS COKE OVEN CHARGING. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 64-8, 1962 Koksikhim. (4) 28-30, 1958. Translated from Russian. CFSTI: 62-11103

The advantages and disadvantages of steam injection used at the Moscow Coke-Chemical and the Zaporozhie Coke-Chemical Plants to attain smokeless coke oven charging were determined. Coke oven batteries with 2 gas collecting mains were investigated. 976 coke ovens were tested in the Zaporozhie plant. The first and second bunkers held 5.5 tons of coal each, the third bunker 6 tons. 923 ovens in the Moscow Coke-Chemical Plant were tested. First, two end bunkers were emptied and the hatches covered; the middle bunker was then emptied. The first and third bunkers contained 6.25 tons each the middle 4.4 tons. A third procedure was also tested. In the first bunker - 6.3 tons, in the second - 4.5 tons, and in the third - 6.2 tons. The end bunkers were simultaneously unloaded and 22 seconds later the central bunker was emptied. Coal dust was directly proportional to time of steam injection. Coal dust and ask were carried off if the coal contained 8.5% of moisture; if 91% of the coal particles measured 3 mm or less in diameter and the partial vacuum at the bottom of the riser was 19 mm, 3.5 kg/min of coal dust were carried away. The injection steam pressure must produce a partial vacuum at the bottom of the riser of not less than 19 mm if charging is to be attained without any gas escape. The Moscow Coke-Chemical Plant procedure can be used with coal containing 7% moisture. Charging by the Moscow Coke-Chemical Plant procedure tested at the Zaporozhie Coke-Chemical Plant with coal moisture content of 8 and 10% had lengthened the loading time, increased the work intensity of the levelling bar, greatly increased the rate of coal dust pick-up, and increased the rate of coal dust pick-up, and increased the ash concentration in the separated tar to 0.153% as against 0.115% by the usual procedure. The efficiency of smoke abatement was considerably higher with the Moscow Coke-Chemical Plant procedure than by that of the Zaporozhie Coke-Chemical Plant. The most promising procedure was the third which consumed considerably less time than either of the other two.

08178

Belousov, S. P., A. S. Dun, and I. I. Nikberg

THE USE OF BATTERY COMBUSTION CHAMBERS IN THE PURIFICATION OF INDUSTRIAL EMISSIONS INTO ATMOSPHERIC AIR.Gigiena i Sanit., 24(4):70-71, 1959. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 54-56, Aug. 1960. CFSTI: TT 60-21913

The gas purifying installation described is of the type used in a Soviet coke-pitch plant. The coke was roasted in batteries of open flame furnaces of the 0Yuzhkokremont0 system; each battery consisted of 10 - 15 open flame furnaces. Reconstruction of the battery furnaces was carried out which consisted in rebuidling part of t he furnace into purification installations of the supplemental combustion chamber type. Thus, the exhaust gases coming from the furnace flues were passed through the supplemental combustion chambers before entering the smokestacks. The supplemental combustion of pitch-coke waste products is accomplished at 1150 - 1500 deg. This high temperature is attained by sucking in extra air through special openings in the supplemental combustion chamber.

08183

Ganz, S., and M. A. Likshin

COKE GAS PURIFICATION FROM HYDROGEN SULFIDE IN HIGH SPEED ROTARY ABSORBERS. Zh. Prikl. Khim., 31(2):191-197, 1958. 1 ref. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 85-93, Aug. 1960. CFSTI: TT 60-21913

The high speed horizontally rotating absorber used in this study was equipped with stationary discs, each of which had

12 paddles set at an angle. Studies were made of the effect of the hydrodynamic, as well as the physico-chemical conditions on the absorption rate. The effect of the hydrodynamic factors was studied with reference to the construction of the discs, their peripheral velocity, the volume rate of the gas flow, the height (volume) of the liquid in the horizontal absorber, and the rate of the horizontal movement of the liquid in the absorber. The effect of the physico-chemical factors was studied with reference to temperature, chemical absorption capacity of the solution and the H2S concentration in the gas. The greater number of experiments was carried out with a sodium arsenite solution containing 8.4 g/l As203. The results of the investigation indicated that the absorption rate of H2S by sodium arsenite solution in a high speed rotary absorber was considerably greater than in tower systems. H2S absorption in a rotary apparatus requires considerably lower reaction volumes, less metal, smaller capital investment and less electric power for its operation.

08428

A. K. Kuzmenkov, V. I. Suryadnyi

THE UNIFORM SPRAYING OF PACKED SCRUBBERS. Coke Chem. (USSR) (English Transl.), No. 4:44-46, 1967.

The degree of wetting of the packing and overlap of the cones from 1 to 10 sprays was determined. The projections of three adjacent cones had only one common point of intersection. The arrangement adopted for the sprays was one in the middle, and the remainder around the periphery. The geometric dimensions needed for the calculations are given in terms of the radius of the spray cone R(sub c). The results of the calculations are tabulated. The degrees of wetting and overlap of the cones have been depicted graphically. High degrees of wetting, equal to 85.3 and 86.8 per cent, and minimum degrees of overlap of the cones, equal to 10.3 and 12 per cent, can be achieved with six or eight sprays. The cone radius R(sub c) depends on the height of the spray above the packing and the hydraulic conditions inside the spray. In eddy sprays the cone is stable with a constant angle of opening of 90 deg under auto-modelling conditions. The height of the sprays above the packing was calculated and checked under commercial conditions.

13491

Vorobev, D. D., V. N. Ilyashenko, M. S. Komarovskii, N. P. Slavgorodskaya, I. I. Rozhyatovskii, E. N. Kucheryavyi, and E. I. Shuleshov

THE USE OF QUARTZ FILTERS IN AN AMMONIA PLANT. Coke Chem. (USSR) (English Transl.), No. 8:38-41, 1968.

To be effective the sand particles in a sand filter should be 0.5-1.0 mm and tar particles 5-10 micrometers in size. The linear filtration speed should be about 5 m/hr and the extent of tar accumulation in the filter should not exceed 50 to 60 kg/cu m of sand. The filter washing rate for periodic removal of tar from the sand should be in the range of 15 to 20 l/sq m at a washing temperature of at least 60 C and a consumption equal to three times the volume of the sand charge. Giprekoks designed a quartz filter meeting these requirements for use in removal of coal tar from weak ammoniacal liquors. The filter was used in a number of works and evaluated after four months. The average coal tar content of the liquor was 234 mg/l, and only 14 mg/l remained after filtration. The filter was washed every 48 hr, and 48 kg of tar were removed each time. During the four months, approximately 78,000 cu m of liquor were purified and 17 tons of tar returned to production. Given good filter operating and washing conditions, it is estimated that 95% of the tar can be removed from the liquor in 96 hr if the initial liquor has an average tar content of 200 mg/l. The equation used in determining maximum permissible tar capacity/cu m of sand is given.

13718

Trofimov, A. I.

REMOVAL OF NITROGEN OXIDES FROM COKE OVEN GAS. (Ochistka koksovogo gaza ot okislov azota). Text in Russian. Koks i Khim., no. 2:42-43, 1966.

An arrangement for removal of nitrogen oxides from coke gases, installed at the Yasinovskiy Coal-Tar Chemical Plant, is described. It converts NO to NO2 (in 110-120 sec at 70-80 C and 15-16 bar), which in turn reacts with olefins to form a resin which, after cooling to 30-40 C, is washed in a scrubber filled with residue from 50 x 50 mm Raschig rings. The installation was designed for operating with a 0.8% oxygen content in the coke gas, but 0.4-0.5% oxygen is found sufficient, precluding the need for introducing air. Operational reduction of nitrogen oxides is from 12-18 to 2-3 cc/cu m. This arrangement was installed at a cost of 234,000 rubles.

14420

Menyakin, E. S.

NOXIOUS EMISSIONS FROM PITCH COKE PLANTS. Coke Chem. (USSR) (English Transl.), no. 12:18-19, 1968.

Several steps were taken in the pitch coke plant at the Cherepovets Iron and Steel Works to prevent the discharge of steam and gases and to replace manual operations with machinery and instruments. Pitch coke oven doors were made airtight by two doors with massive flash plates riveted to their faces. A prolonged check on the performance of the doors showed them to be fully airtight. The door lute material was changed from clay ends to a lute based on the blast furnace trough lining compound to lessen the amount of gas given off when cleaned. Machinery was modernized for mechanical cleaning. All the machinery was controlled from a cabin, thus reducing the time the operator spends in the gas-polluted zone. Waste air was directed to the raw pitch-coke gas pipe, thereby preventing carcinogenic substances from getting into the atmosphere. They are either collected in special apparatus or mixed with coke oven gas and burned in furnaces at elevated temperatures. By taking these steps, the gas emissions were greatly reduced. The jobs of workers in unhealthy sections were made easier and labor productivity rose. The number of production workers per shift was cut from 13 to 9. The two proposed methods are recommended for use in pitch coke plants at other works.

14437

Zlatin, L. E., A. D. Mamatov, L. A. Kabrin, I. V. Maigov, Yu. D. Yukhnovets, T. P. Varshavskii, E. P. Starke, and N. A. Zhukov

THE SMOKELESS CHARGING OF OVENS. Coke Chem. (USSR) (English transl.), no. 12:12-15, 1968. 3 refs.

A new method was developed for the smokeless charging of coke ovens. The charging gases are sucked into the coke side collecting main only, with the coal blend emptied from the charging car hoppers in a 4, 3, 2, 1 sequence. The high-ash tar that is obtained during charging is collected separately rather than mixed with saleable tar. A technique was developed and adopted for utilizing the high-ash tar to oil the coal blend. The nitrogen oxide content of the saleable gas did not rise, because charging gases pass into a separate pipe system to heat the battery. The satisfactory performance of the smokeless charging system enables it to be recommended for adoption at coke

and chemical works supplying coke-oven gas to nitrogenous fertilizer plants. (Author conclusions modified)

14779

Kernan, John J.

SMOKELESS COKE OVENS. (Assignee not given.) U. S. Pat 3,462,346. 6p., Aug. 19, 1969. 4 refs. (Appl. Sept. 14, 1965, 6 claims).

Because retort (by-product recovery) processes are much more costly, interest is again centering on non-recovery processes for manufacturing coke. A new coke oven reduces the smoke and atmospheric contamination produced by earlier non-recovery processes and requires no external source of heat other than that produced in the oven. Green coal and hot coke are cooked in adjacent chambers, and smoke resulting from the incomplete combustion of the green coal is lead to the hot-coke oven where it is almost completely burned before passing to the stack. Before passing through the stack, hot gases from both chambers are passed underneath the chamber containing green coal so that both the bottom and the upper portions of coal are heated. As a result, the speed of the coking process is materially increased.

15271

Andersen, Holger C.

CLEANING OF INDUSTRIAL GASES WITH PRECIOUS METAL CATALYSTS. (Industrielle Gasreinigung mit Edelmetallkatalysatoren). Text in German. Dechema Monograph., 40(616-641):325-33, 1962. 28 refs.

The applications of platinum metals as catalysts for removing acetylene from olefins, cleaning coke-oven gas, and treating residual gases from the nitric acid production are reviewed. Of the family, platinum palladium is particularly suited for the hydration of acetylene so that only a few ppm remain. Recent laboratory tests indicate that at gas throughputs of up to 4500 standard cu m/hr/cu m catalyst, the addition of hydrogen can be reduced to a mole ratio between hydrogen and acetylene of 2. In the case of coke-oven gases, acetylene, nitrogen oxides, carbon oxysulfide, and diolefins are converted into harmless, easily removable compounds by palladium and ruthenium catalysts. Catalytic treatment of residual gases from nitric acid production has three goals: the removal of noxious components, recovery of the nitrogen in pure form for re-use at the ammonia synthesis, and production of heat. Recent laboratory tests show that the process can reduce the nitric oxide content of waste gases to 9 ppm.

156920

Hasebe, S, Takeshi Tsunemoto, Kenjiro Takeshita, and Seiji Arita

DESULFURIZATION OF COALS IN COKING PROCESS. (Sekitan no kokusuka katei ni okeru datsuryu). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 48(512):892-898, Dec. 20, 1969. 8 refs.

In carbonizing coal at high temperatures, 50 to 90% of the sulfur content remains intact. The remaining content of inorganic sulfur is 62 to 66% and that of organic sulfur, 45 to 75%. Inorganic sulfur can be eliminated to a considerable extent by coking coal, but the elimination of organic sulfur is extremely difficult. Several experiments were conducted using Miike and Matsushima mine coals. Since the most suitable temperature for desulfurizing coal is 400 to 600 C, an effective desulfurizing agent and catalyst in this temperature region was sought. The suitable temperature for the desulfurization using hydrogen gas was about 800 C, above which the bonding of sulfur with coal became a great problem. Active hydrogen was supposed to be more effective than the molecular hydrogen. Carbonization of coal in the presence of tetraline, isopropyl alcohol, or cyclohexane as a source of active hydrogen was examined. Tetraline was more effective than hydrogen gas in the temperature region from 500 to 600 C. After transforming organic sulfur to pyrite sulfur in the presence of the compound, sulfur was removed by thermal decomposition. Carbonization with some inorganic compounds other than iron compounds was examined. Strong bases such as potassium hydroxide and sodium hydroxide can remove the sulfur, but their unfavorable effects on the gain and quality of coal prevent their utilization. Calcium hydroxide increases the sulfur content of coal obtained by fixing the sulfur as sulfur compounds, which can not be removed by washing with water or acid.

16157

Kipot, N. S., A. I. Brodovich, and B. S. Filippov

REMOVAL OF NITRIC OXIDE FROM COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 3:38-43, 1969. 47 refs.

Although the amount of nitric oxide in coke-oven gas is small, even the slightest trace reduces the efficiency of equipment for fertilizer manufacture and creates the risk of explosion. Current methods of nitric oxide removal are those that involve compression of coke-oven gas or those that are carried out at normal pressures (800-1000 water guage). When the compression method is carried out in hollow reactors, 70-90% of the nitric oxide can be removed at 100 C and 10-12 atm. When carried out with molybdenum or tungsten sulfide catalysts, nitric oxide is virtually entirely removed at 180-250 C and 16 atm. The best available method for removing nitric oxide from uncompressed gas is purification in electrostatic brush-discharge precipitators. In this process, nitric oxide is oxidized inside the precipitator, on an almost stoichiometric basis, to nitrogen dioxide. The nitro-resins formed by the reaction of the nitrogen dioxide with the unsaturated hydrocarbons present in the gas are speedily deposited inside the precipitator. The nitric oxide content of the coke-oven gas is reduced from 0.5 to 0.006 ppm. This method should receive further study in the Soviet Union where the introduction of smokeless coke has increased the nitric oxide content of coke-oven gas.

16260

Pozin, M. E., E. Ya. Tarat, L. Ya. Tereschenko, and I. N. Orekhov

ABSORPTION OF HYDROGEN SULFIDE BY ARSENICAL SODA SOLUTION UNDER TURBULENT (FOAM) CONDITIONS. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 39(8):1601-1607, Aug. 1966. 15 refs.

Investigations were undertaken of the rate and degree of absorption of hydrogen sulfide by arsenical soda solutions in a foam apparatus with sieve plates in order to establish conditions for purifying coke-oven gas. Empirical equations were derived to express the dependence of the coefficient of absorption on the gas phase velocity and foam height. These equations can be used in design calculations and to determine the influence of liquid-phase processes on the absorption rate. When hydrogen sulfide concentrations exceed a certain limit, the dissolution rate is higher than the neutralization rate, and the absorption rate diminishes sharply. Calculations show that for a given degree of hydrogen sulfide removal, the volume of the foam absorber needed is smaller in the ratio of 7.5 to 1 than the volume of a packed scrubber. A foam absorber with 13-18 trays is required to reduce hydrogen sulfide content in coke-oven gas to 1.5-2 H2S/cu m; one of 38 trays is necessary

to reduce hydrogen sulfide to the permissible domestic level. The foam absorption process appears promising, since the rate of diffusional transfer of H2S from the gas to the liquid phase determines to a considerable extent the total rate of chemical absorption.

16602

Bondarenko, I. P. and Ye. Kh. Zemskaya

EFFECT OF TEMPERATURE ON THE OPERATION OF THE ARSENIC-SODA DESULFURIZATION PROCESS. (O vliyanii temperatury na rabotu mysh'yakovo-sodovoy seroochistki). Text in Russian. Koks i Khim., no. 6:54-56, 1965.

In addition to the Na2CO3/As203 ratio and the pH value of the absorbent solution, and the consumption of air for regeneration of the saturated solution, temperature should be considered a basic parameter of the industrial arsenic-soda process of desulfurization of waste gases. Many years of observation of seasonal variations of the process parameters at the Zhdanov coal-tar chemical plant where the ambient temperature may drop to 3 C in winter and rise to 40 C in summer suggested the possibility of their close correlation. This surmise was confirmed by the results of two series of concurrent parallel plant tests. In both series, samples of uncleaned coke gas were taken directly from the flue through a branched pipe fastened to a single tap hole and the H2S-concentrations, in gram/cu m, in the purified gas in either branch were measured. In one series, gas in one of the branches was pre-cooled to 10 to 15 C, while that in the other branch was pre-heated to 40 to 50 C before entering the respective jars filled with identical arsenic-soda absorbent solutions of the same temperature. In the other series, gas of the same temperature in both branches was passed through the respective absorbent solutions kept at the temperature of 35 and 52 C, respectively. The H2S- concentrations in the purified gas measured in the first series (given in the form of ordered pairs (pre-cooled, pre-heated)) were: (2.42, 1.23) (7.90, 4.82) (3.32, 1.60) (3.68, 3.20) (5.58, 2.47) (4.84, 2.03) (2.51, 1.47) (3.26, 3.02), and in the second series: (9.37, 3.61) (3.32, 0.96) (3.14, 0.86) (3.10, 1.16) (2.87, 1.07) (2.69, 2.04). These results showed that in every case the coefficient of H2S absorption increases with the operating temperature of the absorption process. After the temperature of the absorbent solution of the arsenic-soda desulfurizer of the Zhdanov plant had been raised from 40 to 50 C, this not only intensified the elimination of H2S and the regeneration of the saturated absorbent, but also insured the stability of that solution when its As203-content is high, lessend the deletorious effect on that solution of organic compounds such as benzene, naphthalene, resins, or absorbent oil remaining in the gas after the preceding stage of purification and lowerd the Na2CO3 consumption while making it more uniform throughout the year.

16642

Guentheroth, Hans

NEW EXPERIENCES WITH VENTURI SCRUBBERS FOR FINE CLEANING OF GASES FROM COKING PLANTS. (Neuere Erfahrungen mit Venturi- Scrubbern fuer die Feinstreinigung von Gasen im Kokereibetrieb). Text in German. Dechema Monograph, 48(835-858):329-345, 1963. 4 refs.

The use of PA(Pease-Anthony) venturi scrubber for the separation of tar and naphtalene is described. Coke oven gas is cooled to 35 C, pre-scrubbed, and passed to the PA venturi scrubber, where oil is used as the scrubbing liquid. An average of 0.7 cu m/1000 standard cu m gas are supplied to the scrubber and circulated. About 1/20th of the scrubbing oil is removed per hour for regeneration. The venturi scrubber is operated with a differential pressure of 240-300 mm water. Tar mists are removed to a residual concentration of 38 mg/standard cu m gas; the napthalene is absorbed to a residual amount of 160 mg/standard cu m corresponding to a napthalene dew point of 11 C. This degree of purity is adequate for metallurgical plants, since the temperature in the final coolers is 23 C and never drops below 11 C in the distribution network. It is inadequate for long distance transmission of gas. Such venturi scrubbers were installed by a steel manufacturing company in Gary, Indiana. Two test series studying the efficiency of this type of venturi scrubber for the separation of tar showed the great influence of saturation and cooling. The performance of the scrubber could be improved by pre-cooling the gas prior to its passage through a saturating device. After saturation with scrubbing liquid, the gas is further cooled before it goes to the actual PA venturi scrubber. In conclusion, a novel process for the removal of CH and soot is described from which the gases leave with a residual soot content of 1 mg/standard cu m.

16943

Francis, Wilfrid

THE REMOVAL OF SULPHUR COMPOUNDS FROM INDUSTRIAL GASES. Engineering (London), vol. 172:180-182, Aug. 10, 1951. 3 refs.

Six processes are described for recovering sulfur from coke-oven and refinery gases. The I. G. active charcoal process is applicable to many types of gas and is based on the low-temperature oxidation of hydrogen sulfide in thhe presence of active charcoal. High-quality sulfur is produced; the main limitation is the maximum concentration of H2S permitted, equivalent to 8 grams/cu ft. The Girbotol process is another physical process in which a solution of triethanolamine is used as the scrubbing medium. The process is simple, the solution used long-lasting, and the treated gas contains high proportions of H2S that is readily convertible to either sulfur or sulfuric acid. In the Seaboard process, the gas is passed up a scrubbing tower; a dilute solution containing 2-4% sodium carbonate passes down the tower and dissolves the H2S to form sodium-H2S and sodium bicarbonate from which sulfur can eventually be recovered. Some problems arise from the use of dirty gas and the corrosion of metal parts. In the Ferrox process, a development of the Seaboard process, the H2S is removed by scrubbing with a dilute solution of sodium carbonate containing a fine suspension of iron oxide. The sulfur product is of poor quality and some aeration and oxide- handling problems arise, but its most likely application is for combustion to sulfur oxides for use in a contact sulfuric acid plant. The Thylox process is similar to the Ferrox process except that arsenious oxide is used in solution in place of iron oxide in suspension; the sulfur and waste liquors can be used for insecticidal purposes. The caustic-soda wash process, where the soda removes the H2S as sodium-H2S, may be used where high concentrations of H2S are present. The mercaptides formed in the presence of organic gases must be removed completely from solution in order to sell the hydrosulfide solution readily.

17259

Danielevich, Yu. I. and Yu. K. Tupitsin

REMOVAL OF TOXIC IMPURITIES FROM GASES. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim), vol. 6:45-46, 1969.

A technique and equipment for the removal of toxic organic impurities from waste gases minimized the fuel consumption

needed to purify waste gases with a limited content of combustible substances by oxidizing decomposition products to carbon dioxide and water by using O2 in waste gases. The equipment included a vortex burner, a conical embrasure, and a cyclone firebox which is an internally lined metal casing preferably oblong, 2.5-4.0 m in length. The combined volume of gases was 110,000 cu m/hr. The actual gas consumption was 1 cu m per 60-90 cu m of waste gases. The limiting thermal load was 6,000,000 kcal/hr sq m cros section. The unit was air tight. The equipment operates under pressure and the final products can be used as heating gases. An experimental technique involved the removal of toxic impurities from waste air containing 7-11% O2 and 2.7% CO2 from fatty acid production. Thirty to forty percent of the waste air was admitted via the burner, the remainder being directed into the cyclone firebox. In the firebox, combustion products were mixed with cold waste gases producing a mixture temperature regulated by flow rates of the gases passing through the burner.

17318

Kriz, Milan, Josef Vejvoda, and Bedrich Kedron

EMISSIONS FROM GAS PLANTS, COKING PLANTS, AND THERMAL POWER STATIONS AND MODERN METHODS OF THEIR LIQUIDATION. (Exhalace z plynaren, koksoven, tepelnych elektraren a moderni zpusoby jejich likvidace). Text in Czech. Ustav Vyzkum Paliv Monograph, no. 6, 156p., 1969.

Air pollution in Czechoslovakia as caused by gas plants, coking plants, and thermal power stations is studied. Future developments in these areas up to 1980 are indicated and appropriate control methods are suggested. The number of Lurgi gas plants, which are the major sources of town gas, are not expected to increase, though existing plants will intensify their operations. The present volume of coke production will remain unchanged to 1980. Enormous development is expected in the power station industry, the capacities of which will be designed for a brown coal with a high sulfur content. The study discusses dust generation in the Lurgi process and the most modern control methods used abroad. Desulfurization of waste gases from Lurgi plants is considered with special references to the waste gases from a recently installed Rectisol plant. In considering measures to improve the quality of air around coking plants, considerable attention is give to gas purification, tar separation and treatment with ammonia, and coke-oven gas secondary cooling. A method for the desulfurization of coke-oven waste gas by vacuum-soda is reported. A major part of the study is devoted to the problem of removing SO2 from thermal power plants. Promising dry desulfurization processes proposed for other countries, and Czechoslovak studies on the limestone process, are described. Electrofilters and other dust collecting systems for thermal plant fly ash are reviewed. Also considered is the problem of separating arsenic from the waste gas of one power station. Finally, provisions of the Czechoslovak Clean Air Act of 1967 are criticized. (Author summary modified)

17680

British Coke Research Assoc., Chesterfield (Derbyshire)

PRACTICAL SUGGESTIONS FOR THE REDUCTION OF THE EMISSION OF SMOKE, DUST AND GRIT AT COKE OVENS. Special Pub. 5, May 1962. 26 refs.

Suggestions helpful in dealing with atmospheric pollution problems at coking plants in response to the Clean Air Act of 1956 are summarized. Aspects of efficient heating with minimum air pollution are enumerated. Oven charging techniques are considered with separate attention given to existing plants and new plants, and a method is presented for assessing smoke emission in terms of a 'mass emission factor.' Doors and door frames, oven discharging, and coke quenching are also briefly examined. Comments are made regarding the handling and stocking of coal and coke, and the boiler and ancillary plant.

17849

Ozerskii, Yu. G., G. A. Markus, and V. I. Oratovskii

RECOVERY OF PHENOLS AND HYDROGEN SULPHIDE FROM WASTES DISCHARGED TO ATMOSPHERE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), vol. 6:41-44, 1969. 4 refs.

Given lengthy contact times between an alkaline solution and a mixture of air and gases containing phenols and hydrogen sulfide, the residual contents in the gaseous phase will depend on the dynamic gas-liquid equilibrium conditions. The latter are dependent on a number of factors, including the alkali solution concentration, the nature of the phenols present, the cumulative phenols content of the solution, and the solution temperature. Liquid-vapor equilibrium conditions are investigated at 30-60 C for colorimetric determination by the para-nitroaniline method. Phenol content of the gas-air mixture increases by a factor of 3-5 as the phenolate solution temperature is raised; as the phenols build up in the alkali solution, the gas-air mixture retains a higher residual phenol content. The equilibrium hydrogen sulfide concentration of the gas-air mixture increases from 1 to 5 mg per sq m as the temperature is raised from 30 to 60 C, but the equilibrium H2S concentration in the scrubbed discharge is negligibly small, since the sulfides in the circulating solution are oxidised to form sodium sulfite and thiosulfate.

17943

Belov, K. A. and L. N. Petrova

REDUCING BENZOLE HYDROCARBON LOSSES TO ATMOSPHERE. Coke Chem. (USSR) (English translation from Russian of: Koks i khim.), no. 9:32-36, 1968.

The saturated vapor pressures and volality of crude benzoles and rectification products at two coke and chemical works were experimentally determined. The saturated vapor pressures were determined at temperatures between -15 and +30 C. A three-neck flask was used which was controlled by a thermostat to maintain a constant temperature. When the required temperature was reached, 10 ml of the test substance injected into the flask and the pressure change recorded. The relationship between saturated vapor pressure and temperature was described by the equation lgP equals A - B/T, where P is the pressure of the saturated vapor in mm Hg, T the temperature in degrees Kelvin, and A and B are constants which were found experimentally. Benzene hydrocarbon losses through the breather valves in storage tanks are largely governed by the rate at which the latter are charged and the speed at which the air space in the tanks becomes impregnated with hydrocarbon vapors. To determine the quantity of these losses, 250 ml of benzene was poured into a vessel, the proper temperature was adjusted, and atmospheric air was allowed to enter. The escaping hydrocarbon vapors were caught by activated charcoal. The increase of weight of the activated carbon divided by the volume of air expelled by the vapors from the vessel yields the amount of hydrocarbons lost from the container. The error of this method did not exceed 0.5%.

19203

Dancy, T. E.

CONTROL OF COKE-OVEN EMISSIONS. Iron Steel Engr., 47(7):65-75, July 1970. 5 refs.

The status of equipment developments for controlling emissions from coke ovens are reviewed, and studies now in progress are described. Venturi scrubbers control particulate emission but not benzene-soluble compounds. The AISI coke-oven charging system to reduce emissions is described. A component testing program to provide information on ascension pipe steam ejector design, ascension pipe automation, hopper design, feed hopper shut-off, leveling-bar door automation, and lid lifter design is reviewed. Means of controlling emissions during the pushing operation are discussed. The quenching operation can be a significant source of contaminants. It will take considerable time, manpower, and money to reliably control emissions throughout the industry.

19253

Breitbach, Fritz and Gustav Choulat

APPARATUS FOR DECOMPOSING AMMONIA. (Carl Still, Recklinghausen (West Germany)) U. S. Pat. 3,505,027. 6p., April 7, 1970. 4 refs. (Appl. June 12, 1967, 3 claims).

A process and apparatus for decomposing or destroying ammonia emanating from coke oven plants or gas works without forming nitrogen oxides is described. The ammonia is decomposed into nitrogen and hydrogen by first heating ammonia-containing vapor clouds to the decompostion temperature of ammonia and then passing the vapor through a decomposition zone. The zone may be in the form of a free space or chamber or may comprise a chamber filled with temperature resistant filling bodies or catalysts of a suitable nature. The apparatus is a furnace housing with an interior refractory lining surrounding a centrally located combustion chamber and with several first and second passages encompassed by the lining. The advantages of this process is that no oxides of nitrogen are produced.

19308

Leibovich, R. E., A. I. Bublik, V. P. Shelest, and S. K. Shelkov

HIGH-TEMPERATURE DESULPHURIZATION OF COKE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 11:17- 18, 1969. 9 refs.

Sulfur reduction data are presented for individual grades and blends of Donbas coal carbonized in a Tamman furnace and heated in intervals from 1000 C to 1700 C. The figures show a steady reduction in residual sulfur content of individual coals and blends, the most rapid reduction occurring from 1400-1500 C. The coal which lost the highest proportion of its original sulfur content during carbonization was the grade containing the highest percentage (35.84) of volatile matter.

19733

Shibler, B. K. and M. W. Hovey

PROCESSES FOR RECOVERING SULFUR FROM SECONDARY SOURCE MATERIALS. Bureau of Mines Information Circ., no. 8076, 1962, 62p. 56l refs.

A literature survey on processes for recovery of elemental sulfur and sulfur compounds from secondary source materials is presented, and the more important processes from all non-Frasch sources are described. The text consists of concise descriptions of the general nature of the recovery processes and definitions of major differences between processes proposed for treating the same or similar materials. The bibliography represents the available English language literature on the subject through 1958, with emphasis on the period 1950-1958. In addition to several articles and publications containing general information on sulfur, the text and bibliography on processing methods are arranged under the six principal sources of secondary sulfur, as follows: volcanic sulfur, including all elemental sulfur deposits not adaptable to the Frasch mining process; hydrogen sulfide as found in sour natural gases, petroleum refinery products, and coke-oven gases; sulfur dioxide from the roasting and smelting of metal sulfide ores and from power plant waste gases; pyrite and pyrrhotite obtained by mining mineral deposits or produced as by-products from the concentration of sulfide ore; gypsum and anhydrite occurring as deposits of calcium sulfate; and industrial wastes containing sulfates, sulfites, and sulfuric acid, such as those produced in the steel, paper, and petroleum industries. (Author summary modified)

20960

Barnes, Thomas M., Albert O. Hoffman, and H. W. Lownie, Jr.

EVALUATION OF PROCESS ALTERNATIVES TO IMPROVE CONTROL OF AIR POLLUTION FROM PRODUCTION OF COKE. (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract PH 22-68-65, 149p., Jan. 31, 1970. 90 refs. CFSTI: PB 189266

The findings and recommendations from a 6-month study of air- pollution control in the manufacture of blast-furnace coke are presented. The provision of new or improved equipment for control of emissions from conventional coke ovens, and the development of new, potentially cleaner processes for conversion of coal into blast-furnace coke were investigated. The emissions and control methods for the various processes in conventional coking are discussed (charging of coal to the slot ovens, underfiring the slot ovens with coke-over gas, sealing of slot ovens during early stages, discharging of newly produced coke, and quenching of hot coke). Large investments in new equipment can make a contribution to air quality at and near conventional coke ovens; but by their very nature, such ovens will always be emission sources to some degree. There are no generally accepted devices or procedures for measuring and evaluating emissions and emission controls for coke ovens. It is urged that research instruments and procedures be developed for measuring emissions, since they are needed to permit quantitative evaluation of the effectiveness of control processes and equipment. Several unconventional coking processes that are in the pilot-plant and demonstration stages were examined (fluidized bed operations, forming balls in a hot retort, hot and cold briquetting, curing of briquettes, final coking in gas-fired vertical-shaft furnaces, intermediate and final coking in units that recirculate hot sand, traveling-grate cokes, rotary hearth cokers, and batch-type sole-flue ovens). It is concluded that these processes are more amenable than slot-oven coking to the control of air-polluting emissions. Continued development and industrial trial of these processes should be encouraged. One important contribution would be research conducted to improve understanding of coke properties affecting performance in a blast furnace.

21624

Steinkohlenbergbauverein, Essen (West Germany), Arbeitsgruppe Kokereiemissionen

RESTRICTION OF DUST EMISSION IN COKE QUENCHING COKING PLANTS AND GASWORKS. (Auswurfbegrenzung von Staub beim Loeschen von Koks Kokereien und Gaswerke). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2303, Nov. 1966. Translated from German by D. Ben Yaakov, Israel Program for Scientific Translations, Jerusalem, 4p. CFSTI: TT 68-50469/10

The technology of coking plants and gasworks is reviewed with respect to the emission of dust from the quenching

towers. The quantity of dust emitted during quenching may vary at different points during the quenching process, from batch to batch in the same plant, and from plant to plant, and depends on the nature of the charge and the dimensions and shape of the quenching tower. The former is affected by the nature of the input coal, the final coke temperature, and the operation of the coking oven. The higher the quenching tower, the greater will be the draft and resulting flow velocity of the quenching vapors; consequently, more dust will be emitted from a higher tower. However, the tower must also be high enough to avoid nuisance and environmental damage. Besides design modifications, dust emission can also be reduced by reducing the amount of drawn-in air to reduce the flow velocity, by the impact effect of built-in grates, screens, or baffles, and by spraying into the quenching-steam cloud. Newly erected quenching towers must be equipped with appropriate control devices, and must be designed to meet prevailing emission limits. An appendix describes the apparatus and procedure for sampling dust emission from quenching towers.

21965

Rickles, Robert N.

WASTE RECOVERY AND POLLUTION ABATEMENT. Chem. Eng., vol. 72:133-152, Sept. 27, 1965. 112 refs.

Various methods presently available for the treatment of liquid and gaseous effluents were discussed. Methods and processes that have been used or proposed for the recovery of valuable products were stated as follows: biological oxidation, biological reduction, and chemical oxidation; sedimentation tanks, thickness, flocculation tanks, cyclones, centrifuges, screens, filters, and membrane sieves; foaming and flotation; adsorption; ion exchange; membrane processes solvent extraction; and evaporation and crystallization. The extent of participation of the various segments of the chemical processing industry in the abatement/by- product recovery program was illustrated by specific examples from the petrochemical industry, coal and coke industry, phosphate fertilizers, petroleum industry, and pulp and paper industry. The extent of government involvement, both federal and state, was brought out by listings of federal R&D agencies, state programs of air and water pollution control, state assistance provided for waste treatment facilities, and key provisions of proposed legislation in the area of tax relief to companies buying control or abatement equipment. The prediction was made that when public and governmental pressure becomes great enough, industry will find a way to make a profit out of waste control.

22503

Koehler, Karl-Heinz

COMPARISON POSSIBILITIES IN THE OPERATION OF GAS DESULFURIZATION PLANTS WITH SOLID PURIFIER. (Moeglichkeiten eines Betriebverglei von Gasentschwefelungsanlagen mit fester Reinigungsmasse). Text in German. Glueckauf (Essen), 101(9):568-576, 1965. 2 refs.

Gas desulfurization installations with a solid purifying agent are designed to remove hydrogen sulfide from coke-oven gas so that it can be used as consumer gas or for synthesis. The purification substance used for this purpose in the Ruhr area is a mixture of bog iron ore, Martin mass, and wood chips. An analysis of the factors influencing the output of such installations, namely size, technical construction, the sulfur enrichment factor of the purifying agent, and mode of operation disclosed the existence of a correlation between the operating life of a gas desulfurization installation and the specific mass absorption capacity expressed by the quotient of the purifying mass and the daily supplied quantity of sulfur. The number of purification towers thus represented the parameter for comparison. Sulfur enrichment as a function of the specific absorption capacity of the purifying agent manifested a maximum for each number of purification towers. With an increasing number of towers, the maximum shifted in the direction of lower specific absorption capacity. This finding has to be taken into consideration when an addition of a new tower to an existing 3 to 4 tower installation is contemplated.

23136

Vorobev, D. D., A. P. Sergeev, V. G. Balanov, R. I. Davidzon, V. L. Vodolazhchenko, V. P. Mikhno, and L. N. Tyutyunnik

DUST ARRESTOR PERFORMANCE AND DUST HANDLING IN COKE DRY-COOLING PLANT. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 1:20-21, 1970.

At a coke dry-cooling plant in the Soviet Union, dust is removed from circulating gas to a dust-settling hopper before the gas stream enters the waste heat boiler and again in cyclones before it enters the exhaust fan. By fitting the hopper with high-strength chamotte baffles, the average dust content of the gas entering the cyclones was reduced to 3-4 g/cu m compared to 4-6 g/cu m when the baffles were supported by welded steel girders faced with guniting material. Erosion of the cyclones was checked by lining internal surfaces of all conical sections with cast stone slabs. Coke breeze and dust from the hoppers and cyclones is discharged through a sludge pipeline to a settling tank on a quenching tower. Blockage of the pipe was reduced by increasing its angle of inclination and the addition of more wash down nozzles along its length.

23143

Mitrofanov, N. I.

EXPERIENCE IN THE INTRODUCTION OF SMOKELESS CHARGING OF COKE OVENS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 1:17-20, 1970.

The smokeless charging of coke ovens is possible only when conditions are maintained which allow the gases and fumes associated with charging to be evacuated without hindrance. These conditions are secured by adopting a strict emptying sequence for the charging-car hoppers, avoiding the formation of closed spaces inside the oven, and maintaining sufficient suction in the riser pipes. Steam and gas injection are equally effective, but they affect the rest of the plant in different ways. The wide commercial adoption of gas injection is excluded because of the difficulty of compressing coke-oven gas, the increased load on the exhausters, and the operating problems associated with high pressure gas mains. Nevertheless, if steam happens to be in short supply and compressed coke-oven gas is already available at some point in the plant, it can be used instead of steam as the injectio medium. When gas injection is used, the valves operate more reliably and last longer; less ammonia liquor is produced, and the gas pipelines do not need thermal insulation. On the other hand, the use of gas injection increases the load on the gas blowers and lowers the partial pressures of the chemical constituents, which leads to increased losses in the return coke-oven gas. The disadvantages of using injection include the rapid failure of the fittings (because of erosion on the balls, slide valves, and other surfaces), increased 0ammonia liquor yields and correspondingly increased loads on the ammonium sulfate section, and increased operating costs on the steam pipelines and fittings. The adoption of smokeless charging has reduced the solids and gas pollution levels in the air around the plant as

follows: the dust content has fallen from 173.3 to 15.4-38.9 mg/cu m and the carbon monoxide content, from 92.8-147.0 to 8.3-18.9 mg/cu m. The concentrations of hydrocarbons, hydrogen sulfide, and sulfur dioxide, have also decreased. The purity of the air in the locality has been improved, and the working conditions for the oven-top team have been very greatly ameliorated.

23249

Chertkov, B. A.

CONVERSION OF AMMONIUM SULFITE-BISULFITE SOLUTIONS TO AMMONIUM SULFATE AND ELEMENTARY SULFUR. (Pererabotka rastvorov sul'fit- bisul'fita ammoniya na sul'fat ammoniya i elementarnuyu seru). Koks i Khim., no. 1:48-53, 1956. 9 refs. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, 9p. CFSTI: TT69-55059

There is wide interest in utilizing ammonium sulfite-bisulfite solutions to produce ammonium sulfate fertilizer since the solution can be converted to sulfate without expenditure of sulfuric acid. Furthermore, sulfur-containing waste gases provide an unlimited source of ammonium sulfite-bisulfite. In the 'catasulf process,' hydrogen sulfide from coke oven gas is catalytically oxidized to sulfur dioxide, which is then absorbed together with ammonia to form the sulfite-bisulfite mixture. The latter is processed in an autoclave at high temperature to ammonium sulfate and elementary sulfur. Disadvantages of the process are that the decomposition of the sulfite-bisulfite mixture in the autoclave has to be performed at high pressure and that the autoclave must be made of heat resistant materials. As determined by a kinetic study of the process, decomposition of the ammonium sulfite-bisulfite solutions to ammonium sulfate and elemental sulfur can be performed within a technically acceptable time (1.5 hr) in an open apparatus under normal pressure. For this purpose, the solution must be vigorously mixed in the first stage of the process with a large excess of sulfur, and at the same time heated to 100-105 deg to accelerate the formation of intermediate ammonium thiosulfate. After the required thiosulfate concentration is reached, the solution must be acidified (with H_2S0_4 or SO_2) to convert the residual sulfite to bisulfite and to accomplish complete decomposition of the solution. Pilot-plant tests of the technique could result in the early application of more efficient methods of purifying sulfur-containing gases, including techniques for the simultaneous utilization of NH_3 and H_2S from coke oven gas.

23910

Gurtovnik, P. F., D. P. Dubrovskaya, and Ye. A. Forer

QUALITY OF COAL-TAR ABSORBENT OIL. (O kachestve kamennougol'nogo poglotitel'nogo masla). Text in Russian. Koks i Khim., no. 6: 47-51, 1970.

A number of coal-tar absorption oils, used for the absorption of benzenes, have been analyzed chromatographically. The naphthalene content as determined by standard procedures is more than 1.5 times lower than the value obtained by chromatography. By fractional distillation of these absorption oils, it is possible to increase naphthalene yield from coal tar by 12% (relative), leaving an absorption oil of improved quality and stability in amounts up to 45% of the starting quantity. Laboratory results have been varified in a pilot study.

23911

Khanin, I. M., V. A. Mizin, V. S. Kovalenko, A. T. Movchan, O. G. Nelipa, and N. A. Panesenko

INVESTIGATION OF TRAY-SPRAYER REGENERATORS FOR REMOVAL OF HYDROGEN SULFIDE FROM COKE OVEN GAS. (Issledovaniye tarel'chatoforsunochnyk regeneratorov tsekha ochistki koksovogo gaza ot serovodoroda). Text in Russian. Koks i Khim., no. 6:31-35, 1970. 11 refs.

Experimental studies and prolonged-operation tests of tray regenerators of saturated soda- potash solution point up a need for further improvement of desorption equipment for vacuum-carbonat sulfur removal. A new type of industrial regenerator comprising a combination of hollow- and bubble-tower configurations is proposed. This design yields a power advantage at the same time that it improves the degree of regeneration. A sprayer disperses the saturated solution into a space above the bubble column, thus intensifying the desorption of hydrogen sulfide and significantly reducing steam consumption. Empirical formulae are given for determining the degree of regeneration and optimum process paramete when designing combination regenerators of this type.

24620

Kagasov, V. M., Yu. G. Yefremov, O. P. Klebnikov, D. D. Zykov, V. P. Maykov, A. M. Furman, and P. M. Chernichenko

EVALUATION OF THE PROCESS OF OBTAINING AROMATIC HYDROCARBONS FROM COKE-OVEN GAS. (Otsenka protsessa polucheniya benzol'nykh uglevodorodov iz koksovogo gaza). Text in Russian. Koks i Khim., no. 6:38-40, 1970. 6 refs.

A pilot study of the extraction of benzene from coke-oven gas is evaluated in terms of rate of recovery of benzene and other hydrocarbons, loss of absorbing oil, and power (steam) consumption. Waste gas flow rate was 90 thousand cu m/h with a raw benzene content of 35.8 g/cu m. Chromatographic analysis showed benzene, toluene, and xylene to comprise 98-99% of the hydrocarbons recovered. The use of chromatrographic and spectrophotometric studies is recommended in the evaluation of such recovery operations.

24977

Rott, M. V., V. N. Sevostyanov, and Ya. I. Shukh

THE REMOVAL OF HYDROGEN SULPHIDE FROM COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), vol. 3:32-37, 1970.

A vacuum-carbonate plant was added to a coke and chemical works in the USSR in 1960. The hydrogen sulfide removed from the coke-oven gas is converted to sulfuric acid by a wet catalytic process. Plant modifications introduced in the last nine years have reduced hydrogen sulfide losses and power, steam, and absorbent (soda and potash) consumption and increased sulfuric acid yields. Among the improvements noted is the reduction of scale formation on vacuum-pump cylinders. This has been achieved by cooling the cylinders with purified water, after lining and extracting the carbonate hardness salts. Water throughput in the hydrogen sulfide gas coolers has been increased by dividing the coolers into two independent groups, each with its own gas and water circuits. Difficulties experienced in extracting dust and fines from the contact mass used to oxidize sulfur dioxide to sulfur trioxide were eliminated by purging the contact mass with air. The transfer of sulfuric acid to storage tanks is now automated, and electrostatic precipitators are being redesigned to reduce corrosion and H_2SO_4 losses.

24998

Perederii, P. K.

DEPHENOLOZING SCRUBBER PERFORMANCE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), vol. 3:38-39, 1970.

The phenol extraction coefficient of dephenolizing scrubbers was raised from 0.746 to 0.870 by reducing the thickness of the phenolate packing and increasing that of the alkaline packing, increasing the force with which alkali is pumped into the alkaline packing, and maintaining a water load of 50-55 cu m/hr. The increased thickness of the alkaline packing provides sufficient surface area for contact between recirculating vapors and fresh alkali; the thinner phenolate packing offers less resistance to the recirculating vapors.

25216

Yermolova, V.

REPUBLICAN SCIENTIFIC-TECHNICAL CONFERENCE OF YOUNG RESEARCH WORKERS. (Respublikanskaya nauchno-tekhnicheskaya konferentsiya molodykh issledovateley). Text in Russian. Koks i Khim., no. 7:59-61, 1970.

A report is given of a conference held in Khar'kov April 14-16, 1970 and attended by young researchers, engineers, and technicians. A total of 63 papers dealing with coal-chemistry research and the by-product coke industry were presented, and several of these are reviewed briefly. Removal of nitrogen oxides from coke oven gas in electrofilters with brush dischargers and the reduction of naphthalene content in coke oven gas delivered to the gorlovsk nitrate fertilizer plant presenting a novel method of removing naphthalene from absorbing gases are described.

25315

Altybaev, M. and V. V. Streltsov

REMOVAL OF SULPHUR COMPOUNDS FROM GASEOUS FUELS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 8:43-45, 1966. 12 refs.

Studies were conducted on the role of hydrogen in intensifying the removal of hydrogen sulfide from coke-oven and other fuel gases by iron oxide. The hydrogen required for the experiments was produced by catalytically cracking ammonia. It was added to H2S produced in a Kipp apparatus and the gas mixture supplied to an absorber containing a fluidized iron oxide bed. Final removal of H20 was effected in an absorber containing activated charcoal. In the presence of hydrogen, maximum purification of the gas stream took place at 350-400 C. At hydrogen concentrations of 7-8%, all the sulfur present in the gases passed into the absorbent. The maximum sulfur capacity of different oxide sizes was found at 400 C. The capacity was 20.5% for 0.15-0.25-mm fractions, 18.5% for the waste oxide, and 16.0% for 0.25-0.42-mm fractions.

26075

Finkel'shteyn, P. K., V. P. Babenko, V. N. Kutuzov, and P. L. Saltan

DECONTAMINATION OF USED AIR FROM AN INSTALLATION FOR PRODUCTION OF HIGH-TEMPERATURE PITCH. (Obezvrezhivaniye otrabotannogo vozdukha ustanovki polucheniya vysokotemperaturnogo peka). Text in Russian. Koks i Khim., no. 10:50-52, 1970.

Catalytic oxidation of resins, asphaltenes, carbenes, carboids, paraffins, naphthenes, and aromatic compounds contained in waste gases was studied experimentally. Effective removal can be carried out at 400-600 C, thereby eliminating the possible synthesis of carcinogenic substances associated with fire-box oxidation. Suitable catalysts (bauxite, iron ore) are readily available and relatively inexpensive. Irrigation of the condensors of tray scrubbers to prevent direct contact of the aerosol with the catalyst surface improved efficiency.

26606

Balla, P. A. and G. E. Wieland

PERFORMANCE OF GAS-CLEANING SYSTEM ON COKE OVEN LARRY CAR AT BURNS HARBOR. Blast Furn. Steel Plant, 59(1):22-26, Jan. 1971. (Presented at the American Iron and Steel Institute Regional Technical Meeting, Chicago, Ill., Oct. 15, 1970.)

A larry car system for cleaning emissions from slot-oven coking operations was equipped with combustion chambers with adjustable airports and two stainless steel ventrui scrubbers. Although this system reduced emissions, combustion of gas was not always complete before it entered the scrubbers. By installing gas-fired burners and enlarging airports to increase airport to gasport ratio, scrubber efficiency was raised to about 96% at an oven charging time of 2.5 min. Under these conditions, scrubber emissions are about 0.7 lb/charge (0.16 grains/scf dry) and the only visible stack effluent is a white stream plume. Further improvement is anticipated following the enlargement of combustion chambers and ducts.

26607

Narata, N. and S. Kanbara

A NEW DUST COLLECTION METHOD FOR COKE OVEN QUENCHING TOWER. (Kokusu shokato no datsu shujin hoho). Text in Japanese. (Sumitomo Metal Industry Co., Osaka (Japan)) Japan. Pat. Sho 45-28302. 3p., Sept. 16, 1970. 1 ref. (Appl Oct. 15, 1966, claims not given).

The amount of water required for the rapid, effective quenching of one batch of burnt coke (10-20 tons) causes neighborhood air pollution. An arrangement of water supply outlets is described which cleans and cools the steam and dust generated in such a way that the volume of steam is reduced. Automatic outlets for spraying are provided at the top and side of the quenching tower; a third outlet for cleaning and condensation is provided at the border of the quenching tower and exhaust tower. Water is supplied from the third outlet only during the first 20-30 seconds of quenching, when dust is generated. To avoid increasing the water content of coke on the quenching wagon, the exhaust tower is not installed directly above the quenching tower. The arrangement can easily be adapted to traditional quenching systems.

27441

Ghigny, P.

DUST SEPARATOR INSTALLED IN A COKE PLANT. (Installation de depoussierage dans une cokerie). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 21(301):681-686, Dec. 1968.

The Vilvorde Coke Plant, originally built on flat swampy wasteland along the Brussels Maritime Canal, now finds itself becoming part of a heavily populated area, necessitating the purchase of more adequate dust removal equipment, which is described. Use is made of a system of tubes-within-tubes, by means of which coal is introduced into the furnace through the innermost tube, while the waste gases are pumped out through the ring-shaped chamber between the inner and outer tubes. The furnace is insulated from the external environment by a series of hoods erected above the furnace, into which the waste gases are aspirated by the blower, which is equipped with special rotating screens which aid in condensing the gases

onto the dust particles contained within them, thus removing these particles from the stream of gas. Detail are given on how this basic idea was refined to meet the demands of engineering practice. Tests indicated that the equipment removed 85% of the dust from the plant emissions, and that the unremoved dust amounted to an average of 55 mg per square meter, considerably below the mininum of 300 mg established by a commission of the West German government.

27563

Kalmykov, A. V., V. N. Tyukanov, M. T. Gubanov, and A. M. Dolzhenko

INDUSTRIAL INVESTIGATIONS OF THE WET DUST CATCHER APM-IGI ON A DRYER-TUBE. (Promyshlennyye issledovaniya mokrogo pyleulovitelya APM-IGI na trubke-sushilke). Text in Russian. Koks i Khim., no. 12:6-8, 1970. 3 refs.

An APM-IGI dust catcher with a capacity of 75,000 cu m/h was tested in conjunction with an industrial drier. Operation with a conical nozzle gave 95.3-96.0% coal-dust removal (a reduction from 1.16-2.6 g/cu m to 0.02-0.04 mg/cu m), reflecting a 1.5-2% greater efficiency than was achieved with a disk nozzle. Water consumption rate was 150-175 g/cu m.

27638

Becker, Rudolf

FLUSHING WITH RESIDUAL UNCONDENSED GAS MIXTURE AFTER VACUUM REMOVAL OF CONDENSED COMPONENTS. (Gesellschaft fuer Linde's Eismaschinen A. G., Wiesbaden (West Germany)) U. S. Pat. 3,421,332. 7p., Jan. 14, 1969. 8 refs. (Appl. Dec. 14, 1964, 2 claims).

Regenerative heat exchangers used for removing condensable components of gaseous mixtures are customarily freed of condensate by a counterflow of cold, purified gas in one or more flushing periods. In all systems, the condensed component is recovered in admixture with the flushing gas and is thus in diluted form so that subsequent separation steps, e.g., absorption of fractional condensation, are required at considerable expense. The present invention provides an economical means of separating condensable components from gaseous mixtures without significant material dilution. The method, which is especially helpful in removing hydrogen cyanide, hydrogen sulfide, carbon dioxide, and ethylene from coke-oven gas uses a low-temperature installation in which gas components are fractionally condensed in heat exchangers that are subjected to an exhaust period to eliminate all residual oven gas without substantial volatilization of the condensate. The condensate is subsequently extracted under vacuum without admission of any scavenging gas to the heat exchanger. A final flushing by the gases discharged from the condensate-containing exhanger and cooling of the condensate by pur gas (to prepare the heat exchanger for subsequent condensation) complete the cycle. (Author abstract modified)

28228

Mott, R. A.

PRELIMINARY PURIFICATION OF CRUDE GASES. In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 4, p. 77-120. 27 refs.

Preliminary purification of crude gases which arise from the carbonization of coal in coke ovens (coke-oven gas) and gasworks retorts (town gas), or from the gasification of coal or coke in gas producers (producer gas or water gas) and of coke in blast furnaces (blast-furnace gas) is considered. The purpose of such purification is to remove both vapors of tar, water, naphthalene, and benzole and mechanically carried solid particles of tar, naphthalene, and dust. In certain of the processes considered, preliminary purification includes the removal of ammonia gas. Purification of the crude gases is achieved by cooling or washing (usually with water or oil) and by electrostatic precipitation. Comparison is made between these procedures as they apply in coke-oven practice and gasworks practice. Separate sections deal with special features of the purification of producer gas, water gas, and blast-furnace gas. (Author introduction modified)

28384

Beck, Kurt-Guenther and Wilhelm Weskamp

THE INCREASE OF PRODUCTIVITY OF COKE OVEN GROUPS THROUGH HIGHER OPERATING TEMPERATURES. (Steigerung der Produktivitaet von Koksofengruppen durch hoehere Betriebstemperaturen). Text in German. Glueckauf (Essen), 107(2):43-51, Jan. 1971. 8 refs. (Presented at the Imformationstagung 'Technik und Entwicklung der Veekogung von Steinkohle' der Kommission der Europaeischen Gemeinschaften, Luxemburg, Belgium, April 1970.)

In an experimental coking plant, coals with 20 to 30% volatiles were coked at 1350 to 1500 C. Increasing the temperature from 1350 to about 1490 C reduced the coking time from 14 to 11 hrs and increased the throughput from 24.7 to 34.5 tons/24 hrs. This is a throughput increase of 27.5%. The waste gases produced in the 450-mm wide combustion chambers contained between 7.4 and 8.4% carbon dioxide, depending on the temperature in the combustion chamber and between 2.9 and 3.2 oxygen. Temperatures of the waste gases ranged from 229 C at a combustion temperature of 1348 C to 246 C at a combustion temperature of 1360 C. Waste gases with temperatures between 308 C at a combustion temperature of 1343 C and 339 C at a combustion temperature of 1480 C were measured. The quantity of waste gas produced at an air surplus at n equals 1.2 was 38,988 cu m/24 hrs at 1343 C and 56,520 cu m/24 hrs at a combustion temperature of 1480 C.

28532

Sedach, V. S., G. S. Nosko, Ya. D. Semisalov, and N. A. Polkovnichenko

INCREASING SCRUBBER THROUGHPUT BY MODERNISING THE NOZZLES. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 70:47-48, 1970. 3 refs.

The possibility of improving the design of the nozzles used in benzole scrubbers was investigated in order to give better atomization and increase the volume of liquid absorbent with installing more nozzles. By adjusting the live sections of the spray nozzles, it has been possible to increase the wash oil throughput by 11%. The modernized nozzles distribute the spray more uniformly over the top of the grid packing in the scrubber, and their useful life is much longer. The extra power consumed by the new nozzles is within the capacity of the pumping equipment already provided. (Author conclusions modified)

29217

Marting, Donald G. and George E. Balch

CHARGING PREHEATED COAL TO COKE OVENS. Blast Furn. Steel Plant, 58(5):326-329, May 1970. (Presented at the Iron and Steel Institute, Coke in Iron Making Meeting, London, England, Dec. 10-11, 1969.)

The principal advantages to be derived from the charging of preheated coal to coke ovens are that the required residence time in the coke oven is drastically reduced, while the use of lower cost weakly coking or high oxygen coals to be utilized for a major portion of the coal mix can be used. A reduction in air pollution is accomplished through the use of closed system pipeline charging to replace conventional larry car charging. The system appears to be readily adaptable to automation, while the improvement in battery top conditions helps to solve the increasingly more difficult problem of finding people for this work. Laboratory and early experimental work on preheating are mentioned, as well as pilot plant demonstrations and attempts at commercial operation.

29240

Watanabe, Sadaharu

COKE CAKE GUIDE CART WITH DEVICE TO PREVENT AIR POLLUTION. (Kokus keiki annaisha ni okeru gaiki osen boshi sochi). Text in Japanese. (Shinwa Trading Co. (Japan)) Japan. Pat. Sho 45-38134. 4p., Dec. 2, 1970. (Appl. July 5, 1967, claims not given).

A device was designed to prevent air pollution caused by the dispersion of coke dust when coke cakes are pushed out of a coke oven. Coke dust generation can be kept to a minimum and the dust generated will be effectively collected by a wet type dust collector. The following are installed on a track-guided cart next to the coke oven: the coke guide which guides coke cakes from the oven to the quench cart, the dust hood which absorbs dust gas rising from the coke cakes, and the dust collector which is connected to the dust hood. Dust gas generated during transfer of coke cakes through the coke guide is kept to a minimum and will never be discharged into the atmosphere. Since the coke guide is shaped so that is aperture gradually windens toward the exit and since it is made to plunge into the dust hood to assure air-tight connection while permitting free slide action, coke cakes will move very smoothly through the coke guide into the quench cart, thus giving a minimum crushing of coke cakes during the transfer to assure minimized generation of dust gas. Thus, less volume of air is needed for dust collection. As a result, a dust collector of smaller output capacity can be used with this system for economical operation.

29628

LAW-MAKERS SAY: CLEAN UP OR SHUT DOWN. Can. Chem. Process., 55(4):47-50, April 1971.

The major push by the Canadian government to control air pollution will surely come once Parliament approves Bill C-224, the Clean Air Act. Under the Act, air polluters may be fined up to $200,000 per instance of violating one or more of the emission standards to be set by the Federal government. Also, the Act will empower federal authorities to fine any pollution source regardless of location; this is a major departure from current federal/provincial division of powers. Controlling the fumes from coking is mentioned, as well as regulations pertaining to the emissions from petroleum refineries, lead-in gasoline, automotive emissions, and aircraft exhaust smoke. Processes for the removal of sulfur dioxide are listed tabularly. The British Columbia government has offered a prize of $250,000 for the first individual or company to come up with a device to eliminate air pollution and odor of pulpmills.

29900

Koyama, Setsu, Yasuo Saito, Shigenori Komura, Koji Tashiro, Yasumasa Ishibashi, Shozo Sugita, Yuzo Yamashita, and Tetsuji Hayashi

TECHNICAL DEVELOPMENT OF MITSUBISHI-LURGI GAS CLEANING PLANT. Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 8(2):239-249, March 1971.

Mitsubishi and Lurgi Apparatebau G.m.b.H. in West Germany both worked on gas cleaning plants singly and jointly. Lurgi studied the essential components of the plant, and Mitsubishi tested various conditions on an actual plant. The problems of gas distribution, erosion, corrosion, and construction are discussed. Also, the installation of electrostatic precipitators, multicyclones, cyclones, stabilizers, and venturi scrubbers are discussed. Several relationships were examined in electrostatic precipitators, including the relation between distance of electrodes and critical voltage; the relation between distance of electrodes and the corona current in an electrostatic precipitator for an electric arc furnace; the relation between distance of electrodes and corona current under gas with talc of 5 micron mean diameter; the relation between distance of electrodes and migration velocity of dust particles; the relation between sparkover voltage and specific surface area of a dust particle; an example of the voltage measured in an actual electrostatic precipitation for a sintering plant; and an example of the specific electric resistance of dust. Lattice, louver, and flap deflectors are also discussed. Flow distribution and deviation are described. Other topics include the relation between pressure loss and cyclone performance; the effect of blow down in a multicyclone; examples of performance of a two-stage venturi scrubber, a twist layer filter, and the weight reduction tendency on a dry precipitator; the evaporation speed of a water droplet in a gas cooler; examples of the amount of sulfuric acid measured and a corrosion test at an electrostatic precipitator for an oil firing boiler, and the gas analysis at partial burning of LD converter gas; the explosion band of mixed gas; the relation of flow ratio to the performance of canopy hood and lateral exhaust hood; the relation between performance and dimension of canopy hood; and examples of gas cleaning plants installed in a steel works, cement works, sulfuric acid plants, and coke ovens.

31123

Oki, Taketo, Tetsu Abe, Akira Toyama, and Shigeru Haseba

CONTACT TYPE REMOVAL METHOD FOR NO CONTAINED IN GAS MANUFACTURED FROM COAL, COKE, OR OIL. (Sekitan, cokusu, abura nado o genryo t suru gasu chu no sankachisso no sesshokuteki jokyo hoho). Text in Japanese. (Nikki Kagaku K. K. (Japan) and Kobe Seikosho K. K. (Japan)) Japan. Pat. Sho 46-18383. 4p., May 22, 1971. 1 ref. (Appl. Sept. 18, 1967, 1 claim).

A new nitric oxide removal method with good efficiency was described. The catalyst is made of an iron oxide and pretreated with hydrogen sulfide at a low temperature. The catalyst is used for a contact reaction to selectively remove NO while minimizing losses of carbon monoxide, ethylene, and other useful contents of the gas. The catalyst, made of r-FE203.H20 or Fe304, or an iron oxide containing both, is molded as it is or with a silica, alumina, magnesia, or diatom earth carrier and treated with hydrogen sulfide at 50-100 C. The gas manufactured from coal, coke or oil is treated at the temperature of 150-250 C by this catalyst to remove NO contained in the gas.

31138

Jagnow, Hans-Joachim

PRODUCTION OF RICH GAS BY THERMAL HYDROCRACKING OF MINERAL OIL MIXTURE WITH COKE OVEN GAS AS HYDROGEN SOURCE. (Reichgaserzeugung durch thermische hydrierende Spaltung von Mineraloelgemischen mit Kokereigas als Wasserstoffquelle). Text in German. Erdoel Kohle (Hamburg), 24(6):384-389, June 1971. 2 refs.

Over a period of six years, experiments were conducted in a small pilot plant and in a scaled-down laboratory device to collect data for planning large cracking plants using coke oven gas as a hydrogen source. For the experiments, the gas recycle hydrogenator was used. All hydrocarbons from light naptha, with an upper boiling point of roughly 100 C, to crude oil distillate, with an upper boiling point of about 350 C, are suitable. Both cleaned and partially cleaned coke oven gas can be used. The quality of the end product is the same in either case. However, when using uncleaned coke oven gas, the ammonia must be removed to avoid ammonium carbonate formation. The removal of hydrogen sulfide prevents corrosions. It is also advisable to remove benzene from coke oven gas prior to its use. Such partly cleaned coke oven gas is free of NH3, contains about 1.5 g H2S, and up to 10 g benzene/cu m. A rough cost estimate shows that the heat price of the produced enriched gas is higher than the heat price of the coke oven gas. However, coke oven gas will sell at a lower price in the future. Thermal hydrocracking provides a large new market for the use of this gas.

31223

Kosaki, Motokiyo

ON EQUIPMENT DESIGNED TO DISPOSE OF COMBUSTIBLE WASTE GAS AND DISPERSE IT INTO THE ATMOSPHERE. (Kanensei haigasu taiki hosen setsubi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(7):17-26, July 1971. 5 refs.

Combustion/dispersion equipment, designed to remove the combustibles, noxious contents, and offensive odors from waste gases by combustion, and thereafter discharge the waste gas for atmospheric diffusion is described. The Technical guidelines for designing the respective component units of the equipment or plant are also described. Among the combustible waste gases are blast furnace gas, coke oven gas, converter furnace gas, metal refining waste gas, naphtha refining waste gas, gasoline cracking gas, and hydrocarbon cracking gas. The main component units of the equipment include a knockout drum, seal tank, flame arrester, ignition device, flare gas burner, and stack with a stack support tower. The knockout drum is designed to remove solids, liquid contents, and condensate from the saturated gas contained in the flare gas, and water content given off from washing. The seal tank prevents back fire from going from the flare stack to the flare gas line. The tank is kept filled to a specified water level to seal the mouth of the flare gas line, which is held underwater. The flame arrester also prevents back fire. The ignition device ignites the pilot burner, which in turn ignites the flare gas burner nozzle, located above the ground level. The ignition device allows the burner to be ignited from the ground level. The flare gas burner comes in various sizes and types, and can be selected according to operating conditions. The stack and stack support tower can also be built to suit the operational conditions.

31682

Marchenko, Yu. G. and V. E. Novikov

DETERMINING THE MINIMUM LOSSES OF BENZOL HYDROCARBONS IN THE FINAL COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 11:30-32, 1970. 2 refs.

Based on analysis of a mathematical model of closed-cycle absorption-desorption processes in benzol (benzene) plants, benzol losses in the final coke-oven gas can be minimized only by controlling the wash oil circulation rate. Since the optimum circulation rate for wash oil varies widely according to specific operating conditions in a recovery plant, a specific mathematical model of the benzol scrubber unit must be constructed for each case.

31777

Revzin, I. G., S. N. Ganz, Ya. I. Shukh, and I. N. Gorokhov

PRODUCTION OF THIOUREA FROM CALCIUM CYANAMIDE AND HYDROGEN SULPHIDE FROM VACUUM-CARBONATE SULPHUR REMOVAL PLANT. Coke Chem. (USSR) (English translation from Russian of: Koks I Khim.), no. 3:27-29, 1970. 8 refs.

A process has been developed for making thiourea (2CS(NH2)2) from calcium cyanamide and the hydroge sulfide from vacuum-carbonate sulfur removal plants in the coke and chemical works. The chief merits of the proposal are that the process is continuous, one stage is eliminated, side reactions are reduced to a minimum, and the reaction rate is high. Values have been determined for the basic parameters, as well as the raw materials consumption figures. (Author conclusions modified)

33382

Sommers, Hans and Werner Last

REMOVAL OF ORGANIC SULPHUR FROM COKE OVEN GAS. III. TEST RESULTS WITH TWO STEP PROCESSES. (Entfernung von organischen Schwefel au Koksofengas. III. Ergebnisse der Versuche mit zweistufigen Verfahren). Text in German. Erdoel Kohle (Hamburg), 24(9):578- 586, Sept. 1971. Part I. Ibid., 24 (7):473-477, July 1971. Part II. Ibid. 24(8):525-529, Aug. 1971.

For the hydrogenation of organic sulfur compounds to hydrogen sulfide, a four percent cobalt oxide and 12% molybdenum trioxide catalyst with a five percent nickel oxide and 11.5% molybdenum trioxide catalyst were used in a two-step removal process. The catalysts had a bulk weight of 690-760 g/l and a specific surface of about 250 sq m/g. A third catalyst with about one percent platinum on aluminum oxide was in the form of granules two to four mm in diameter; a fourth catalyst had a high nickel content. At increased pressures, the first two commercial catalysts proved to be suitable for hydrogenation. The laboratory-made platinum catalyst was suitable at atmospheric pressures. Iron compounds are recommended to replace zinc compounds for the absorption of hydrogen sulfide once it is already formed.

34081

Lee, G. W. and J. P. Graham

MITIGATION OF SMOKE, DUST, AND GRIT AT COKE-OVEN PLANTS. Iron Steel Inst., London, Spec. Rept., no. 61:51-55, 1958. 10 refs. (Presented at the Iron and Steel Institute, Air Pollution Meeting, London, England, Sept. 25-26, 1957.)

Coke oven plants and the present scale of carbonization are examined with respect to primary sources of smoke, grit, and dust emissions, preventive actions, and future developments. Pollutant emissions occur during charging, carbonization, and discharging, quenching, and handling of coke. Improvements in the processes to mitigate emissions include efficient door handling to obviate unnecessary exposure to heat, careful attention to the design of the coke guide, oven tops, and coal charging hoppers, the use of a double take-off, portal-type changing cars, improved design of charge-hole cover, mechanical cleaning of self-sealing doors and oven tops, dry quenching, and the total enclosure of coke screens.

34083

Purcell, P. R. and T. H. Williams

THE EXTRACTION OF SULPHUR FROM COKE-OVEN GAS AND THE MANUFACTURE OF SULPHURIC ACID. Iron Steel Inst., London, Spec. Rept., no. 61:56-61, 1958. (Presented at the Iron and Steel Institute, Air Pollution Meeting, London, England, Sept. 25-26, 1957.)

An account of the Collin process shows that desulfurization of the coke-oven gas, combined with the manufacture of sulfuric acid from the recovered hydrogen sulfide by the Chemiebau wet contact process, has been introduced with success on the coking plant at Corby in Britain. The type of process which was installed at Corby is an absorption-desorption process using ammonia liquor as a scrubbing agent. The absorption is carried out in unpacked towers so that no excessive additional load is placed on the gas exhausters, and the concentration of the ammonia liquor of about 1.5% is such that it is in equilibrium with the ammonia content of the gases and no plant for the production of concentrated ammonia liquor is required. Following the solution of the corrosion troubles encountered in the early operation of the plant, it has since worked with satisfactory consistency. Desulfurization of 70-75% is achieved and the quantity of acid produced is just about sufficient to meet the requirement for ammonium-sulfate manufacture in the by-product plant.

34207

Viswanathan, T. S. and S. Visvanathan

RECOVERY OF SULPHUR FROM COKE OVEN GAS: A CRITICAL REVIEW OF METHODS. Tisco (Jamshedpur), 15(3):104-110, July 1968. 27 refs.

Coke oven managers have long been aware of the anomaly that while they have to buy sulfur to make the acid to fix the ammonia in coke oven gas, they must also incur considerable expense and trouble eliminate the sulfur to meet consumer requirements. Dry processes for the removal of sulfur include an oxide purification system, the Katasulf process, and a fluidized bed process; wet processes include the Seaboard process, vacuum carbonate or hot actification process, Alkazid process, Thylox process, Giammarco-Vetrocoke process, and iron suspension process, the Collin process, Tata-Collins process, and the Stretford process. A review of the various established methods for the removal and recovery of sulfur from coke oven gas and their possible applicability to the Tata Iron and Steel Works shows that the Thylox process, which yields elementary sulfur, or the vacuum carbonate and the Collin process, which furnish the sulfur as hydrogen sulfide, offer economic possibilities.

34336

Zlatin, L. E., G. I. Trondina, Yu. P. Artamonov, A. L. Shtein, and Yu. D. Yukhonovets

DENITRATION OF SULPHURIC ACID FOR THE PRODUCTION OF AMMONIUM SULPHATE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 3:43-44, 1970. 4 refs.

At a Soviet coke and chemical plant, ammonium sulfate is made from spent 72-73% sulfuric acid taken from the nitrobenzene plant. The nitrogen oxides contained in this acid contaminated the coke oven gas, rendering it unsuitable for subsequent use for ammonia synthesis. Thorough denitration of the sulfuric acid is now effected by adding urea to the acid and agitating the mixture with compressed air. The compressed air also serves to remove the nitrogen formed as the urea reacts with the nitric oxides. The removal of the nitrogen accelerates the reaction between the nitric oxides and the urea. A sulfuric acid storage tank is used as the denitration vessel, and the process reaches completion in three to four hours. When the ammonium sulfate plant is operated with acid denitrated in this way, the nitric oxide content of the coke-oven gas remains unchanged.

34421

Litvinenko, M. S.

UKHIN IN THE CHEMICALIZATION OF THE NATIONAL ECONOMY. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 4:34-37, 1970.

Process developments are enabling Russian coke and chemical plants to supply chemical and other industries with needed raw materials and intermediates. The developments include the long-distance transmission of coke oven gas for ammonia synthesis, the production of phthalic anhydride and pure anthracene, the continuous formaldehyde purification of napthalene, the production of sodium hydrosulfide and ammonium sulfide from hydrogen sulfide gas, the production of mesitylene and m-xylene, the production of pure sodium thiocyanate, and the catalytic refining of benzene for syntheis. Additional products will be made at coke and chemical plants scheduled for construction within the next five years: dark coumarone-indene resins, n-cresol, p-cresol, pitch semicoke, prepared tar, road tar, colloidal sulfur, 2-vinylpyridine, pyrene, acenaphthene, and acenaphthylene. Specific product applications are cited and the need to expand the market for aromatic products of carbonization is noted. Radical improvements in recovery techniques applied to the main chemical products of carbonization are greatly reducing air and water pollution. The improvements involve placing the hydrogen cyanide and sulfide recovery plant first in the gas flow sequence.

34465

POLLUTION CONTROL PROGRESS. INDUSTRIAL CASE STUDIES. J. Air Pollution Control Assoc., 21(11):728-730, 738, Nov. 1971.

Successful case studies of pollution control in industrial emission sources are reviewed. Odor, emitted by condensation products from oils and pitch condensates from wood chips, in a hardboard tempering plant was controlled by fume incineration treatment; heat recovered from the process was used to preheat the incoming contaminated gas prior to incineration, resulting in a 60% saving in fuel. Emissions from electric power plants were controlled by conversion from coal to butane/propane fired boilers and by a filtering system to eliminate fly ash. A portable sprinkler system to control fly ash collected by precipitators on electric generating station

grounds was nearly 100% effective in preventing stored fly ash from being windborne. Coke ovens designed for smoke control and automated fume control systems for electric arc furnaces controlled emission from steel plants. A scrubbing system, consisting of a dry cyclone collector, a wet scrubber, and a mist eliminator, was used effectively in a coal preparation plant. Conversion of conventional sulfuric acid plants to the double contact process effectively reduced sulfur dioxide emissions and increased recovery capacity. An incinerator unit was used to dispose of residual tar fractions (fly ash and airborne solids) from a phenol plant. Plasticizer emissions from the flooring operations of a cork industry were controlled by mist eliminator elements.

35284

Carbone, Walter E.

COKE-OVEN EMISSION CONTROL. Iron Steel Engr., 48(12):56-60, Dec. 1971.

Total emissions (dust, carbon monoxide, hydrogen sulfide, sulfur dioxide, benzene, and tar) from coke oven charging operations can amount to almost six tons/day. A solution to the emission problem may be the pipeline charging of preheated coal to coke ovens. In a typical charging system, coal no larger than one inch is first fed to the flash-drying entrainment section of the preheater unit. Here only particles less than one-eighth inch are removed. Larger particles are suspended until heated to a surface temperature of 700 F and crushed to less than one-eighth inch by a rotating swing hammer. Coal leaving the preheater goes to a primary cyclone where approximately 80% is recovered. Effluent from the primary cyclone is then sent to four or more secondary cyclones where the remaining coal dust is collected. Overall efficiency of the cyclone recovery system is 99.5% of the coal input. Coal from the cyclones is collected on a common screw conveyor and discharged to charging bins. A portion of the gas from the secondary cyclones is recycled back to the combustion chamber, and the balance sent to a wet scrubber. Since the system is completely sealed, no emissions escape to the atmosphere during charging operations. The method also reduces emissions occurring during pushing operations.

35503

Grosick, Herbert A.

SYSTEM FOR THE REMOVAL OF NAPHTHALENE FROM COKE OVEN GAS. (Koppers Co., Inc. Pittsburgh, Pa.) U. S. Pat. 3,581,472. 5p., June 1, 1971. 2 refs. (Appl. Aug. 8, 1969, 10 claims).

In the past, residual naphthalene has been removed during the final cooling of the coke oven gas by precipitating as crystals. However, this can cause clogging and does not completely remove naphthalene vapor. Therefore, on improved process was developed for the removal of naphthalene from coke oven gas. Coke oven gases are cooled in a primary cooler to about 100 F to condense a light oil fraction (primary cooler tar) from the gas. The condensed tar is collected and withdrawn from the primary cooler; the naphthalene is stripped from the tar and is scrubbed from the cooled gas with the primary cooler tar. (Author abstract modified)

35759

Kipot, N. S., A. I. Brodovich, and V. M. Zaychenko

BRUSH DISCHARGE FILTERS USED FOR THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS. (Ochistka koksovogo gaza ot okisi azota v elektrofiltrakh s kistevym razryadom). Text in Russian. Koks i Khim., no. 5:31-34, 1971. 10 refs.

Removal of nitric oxide from coke oven gas by means of electric brush discharge filters was investigated on a pilot plant. The voltage potential promotes conversion of oxygen (contained in the coke oven gas) into ozone, which enhances the oxidation of NO into nitrogen dioxide. Removal of NO from coke oven gas is affected by the voltage potential created within the electric filter, by the period of permanence of the gas within the filter, and by its initial content in NO. A certain volume of gas to be cleaned should spend at least nine seconds within the filter under conditions of 32 kilovolt to achieve a 93% removal of NO. The efficiency of this cleaning process is optimal under conditions of 41 kilovolt, but increased initial concentrations in NO produce negative results. Thus, concentrations of 0.62 cu cm/cu m NO achieve a 93% cleaning of the coke oven gas, while initial concentrations of 3.66 cu cm/cu m NO decrease the extent of the cleaning process to 72%. Both observations were carried out with 34 kilovolt potentials. A mathematical relationship expressing the dependence of the cleaning process upon the three mentioned factors effects design criteria for such gas cleaning facilities according to the cleanliness to be achieved and the initial concentrations in NO existent in the given gas.

37343

CONTROLLING EMISSIONS FROM COKE OVENS. Environ. Sci. Technol., 6(2):118-119, Feb. 1972.

Since the early 1900 s, by-product ovens have become standard and collect most of the volatile material during the coking operation for conversion into useful products such as gas, tar, and ammonia liquor. Coke oven emissions contain carbon monoxide, sulfur dioxide, hydrogen sulfide, hydrogen cyanide, and phenol. Charging contributes the largest part of the emissions in the coking operation. Design and construction of a $1.5 million prototype system for smokeless charging of coke ovens has been sponsored jointly by the American Iron and Steel Institute and the Environmental Protection Agency for the past three years. The idea behind the prototype system is that if coal is fed into an oven through a sealed feed hopper and adequate suction is maintained by properly designed steam jets, pressure in the oven will never be positive during charging. National Steel Corp. is hoping to solve the environmental problems in charging, pushing, and quenching by one complete system. A completely self-contained charging system will use double collecting mains and a method known as charging on the main, a sulfur removal system to produce elemental sulfur, an ammonia destruction system, oxides of nitrogen control system, and a closed system for coke pushing and underground quenching. Another demonstration project is a coke pellet manufacturing process designed to eliminate coke oven emissions by eliminating coke ovens.

37674

Gobiet, Viktor

REDUCTION OF THE DUST EMISSION DURING THE PROCESS OF PRESSING THE COKE THROUGH THE COKE MASS PILOTING STATION BY A DUST COLLECTOR. (Verminderung der Staubemission beim Druecken des Kokses durch Entstauber-Kokskuchenfuehrungswagen). Text in German. Glueckauf (Essen), 108(5):180-183, March 1972.

The process of pressing coke through the coke mass piloting station produces dust in the opening of the coke oven door, in the exit of the coke mass from the furnace chamber, in stirring the coke in the tub of the piloting cart, and in the breaking and falling of the coke into the quenching trough. For reducing the dust emission, a mobile roofing with an exhaust fan and dust collector was installed over each coke mass piloting and quenching cart. At first the dimensions of the exhaust fan

were underestimated, and it had to be enlarged. The final version was connected to two independently-operating rotary wet collectors. Examination of the newly installed dust collection system revealed that the quantity of dust-laden air being drawn off by the exhaust fan depends on the prevailing wind conditions. On the average, 90% of the emissions are drawn off. The wet collectors achieve collection efficiencies of 97.5 to 97.7%. The average wind speed at the time of the collection efficiency measurements was 10.6 m/sec; the prevailing wind direction was south to southwest.

38832

Pustovit, Yu. A., V. M. Kirillin, T. V. Shinkareva, and G. Ye. Borodina

AN ANALYSIS OF TECHNICAL PROCEDURES TO BE APPLIED FOR THE EXTRACTION OF AMMONIA AND ACID COMPONENTS FROM COKE GAS. (Analiz tekhnicheskikh razrabotok po izvelecheniyu ammiaka i kislykh komponentov iz koksovogo gaza). Text in Russian. Koks i Khim., no. 1:44-48, Jan. 1972. 8 refs.

The basic trends in the field of the extraction of ammonia and acid components from coke gas are outlined on the basis of an analysis of related inventions and technical solutions in the U. S., USSR, Great Britain, and the German Federal Republic during 1950-1967. In the next 5-10 yrs, ammonia from coke gas will be utilized in fertilizer production, and the technology used in manufacturing ammonium sulfate will be further developed to obtain macrocrystalline and granulated products. The importance of processes for the extraction of acid components is confirmed by the increasing number of related new methods and apparatus. More than 550 patents relating to the extraction of ammonia water, free ammonia and acid components such as hydrogen sulfide, the production of ammonium sulfate, and extraction equipment have been registered in the four countries during 1950-1967. Nitric oxide present in coke gas can be removed by means of ultraviolet rays on catalysts in the presence of unsaturated compounds.

39656

Smith, Jack

COAST S LARGEST STEEL PLANT KEEPS AIR CLEAN. Air Eng., 1(8):21- 24, Nov. 1959.

The solutions to air cleaning problems at a steel plant are presented. The sinter plant stack was built 301 ft high to obtain better dispersion of the sulfur gases emitted. As a second step to eliminate the sulfur problem, all plant railroad equipment was diesel powered. Four Thomas continuous autometers were installed at varying distances from the mill to record sulfur concentrations in the atmosphere. Three devices were installed next to each blast furnace in order to clean the gases. First, the gas goes through a primary inertial-type dust catcher which removes 62% of the incoming dust. The gas is further cleaned to 98.75% in a gas washer. After the gas passes through a pair of water film electrostatic precipitators, 99.98% of the incoming dust is removed. The coke ovens are equipped with self-sealing doors. Baghouses and dust collectors were designed into the raw materials system, greatly reducing the amount of ore dust. The open hearth stacks were built higher than customary for proper dispersal of furnace emissions. Cottrell precipitators were installed on the open hearth furnaces.

39751

Belin, F. T., Ya. M. Bergart, N. N. Nikolaev, S. Ya. Shapiro, and O. I. Eliseev

A BOILER FOR HYDROGEN SULPHIDE COMBUSTION. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 6:52-55, 1971.

An improved design for a boiler for the combustion of hydrogen sulfide was adapted for use in the sulfur removal plant of a coke and chemical works. The boiler is of the through-flow separator type connected to an afterburning chamber. Its basic merits include intense heat transfer in the firebox, gas exit temperatures that can be regulated against changes in load, highly efficienct mixture formation in the burner unit, minimum formation of nitrogen and sulfur trioxide, resistance to corrosion, and simple design. The combustion products are cooled to 700-750 C in the boiler before going for conversion to sulfuric acid by the wet catalytic process.

39904

Sussman, Victor H.

AIR POLLUTION AND ITS CONTROL IN THE STEEL INDUSTRY. Iron Steel Engr., 39(5):80-84, May 1962. 5 refs.

Production of one ton of steel requires the use of over 10 tons of air. Blast furnace production of one ton of iron results in 0.6 tons of slag, 0.1 tons flue dust, 5.1 tons gas, and occasional mushroom clouds from furnace slips. Size and power requirements of air cleaning systems present major economic considerations. Regulatory requirement vary depending upon population density, meteorological conditions, and topography. Gas cleaning equipment consists of a wet scrubber and an electrical precipitator. It is impractical to provide gas cleaning equipment for the large volumes of dust-laden gas discharged periodically as the result of blast furnace slips. Hydrogen sulfide gas emanating from slag quenching pits presents an offensive odor in nearby communities. Recent modifications in blast furnace operations such as the injection of fuel oil have contributed to air pollution. The by-product coke oven releases contaminants during charging, coking, pushing, and quenching. Sintering plants are equipped with collectors and electrical precipitators. In open hearth operations, variations in dust loadings and gas discharge rates complicate the economic design of collectors. Electrical precipitators clean gases with 98% efficiency, cleaning 700,000 cu ft/min and discharging gas with a loading not over 0.05 grains/cu ft. Filtration methods for cleaning open hearth gases are being studied by Harvard School of Public Health. Air pollution problems associated with the Bessemer converter are similar to those of the blast furnace and open hearth. The control of sulfur and other noxious gases emitted during coal burning operations is being studied by the Bureau of Mines and other groups. Because air pollution control is relatively new, standards for control equipment and emission standards are incomplete. Plant management should accept responsibility for air pollution control and make positive provisions for control devices in new construction.

39960

O Mara, Richard F.

DUST AND FUME PROBLEMS IN THE STEEL INDUSTRY. Iron Steel Engr., 30(10):100-106, Oct. 1953. 6 refs.

The major areas in a typical steel plant operation where some form of dust or fume control equipment is applicable are reviewed. Hoods, ventilating fans, and cloth filters can be used in the screening segment of ore handling operations.

Mechanical collectors used in combination with electric precipitators have a recovery efficiency of 98-99% in the sintering plant. Dust from the coke screening plant can be controlled with hoods, ventilation, and recovery equipment. The advent of center inlet design in blast furnace gas precipitators has proven advantageous; however, adequate precipitation equipment for open hearth emissions has not yet been developed. Bessemer converters present the greatest difficulties in dust control; hooding problems are discussed. Test data indicate that electrical precipitation is applicable. The design of control equipment, including scrubbers and electric precipitator, for electric furnaces is considered. Other in-plant emission sources are noted: limestone and coal handling, coke oven gas cleaning, open hearth raw materials, department power house, blooming mill operations (scarfing machines), hot strip mills, pickling plant, and powdered fuel heating furnaces.

40232

Thring, M. W. and R. J. Sarjant

DUST PROBLEMS OF THE IRON AND STEEL INDUSTRY. MEASURES TO STOP ATMOSPHERIC POLLUTION. Iron Coal Trades Rev., 174(4636): 731- 735, March 29, 1957. (Presented at the Institution of Mechanical Engineers Conference, London, England, Feb. 1957.)

Control methods to remove dust and fumes from waste gases emitted by specific processes within the iron and steel industry are reviewed. The applicability, efficiency, cost, and operation of electrostatic precipitators, venturi scrubbers, continuous slagwool filters, hoods within exhaust systems, wet scrubbers, wet impingers, bag filters, wet tower gas washers, centrigugal separation, aerodynamic separators, and overfire air jets, to control the emissions of iron oxides, manganese oxides, and silicon oxides are examined. The adaptation of the control equipment and process and design modifications are examined for the open hearth furnace, Bessemer converter, arc furnace, cupola, blast furnace, coke ovens, reheating furnaces, and small heat-treatment furnaces.

40266

Speight, G. E.

AIR POLLUTION CONTROL IN IRON AND STEEL INDUSTRY. J. Fuel Heat Technol., 19(2):20-23, March 1972. (Presented at the International Air Pollution Control and Noise Abatement Conference, Jonkoping, Sweden, Sept. 1-7, 1971.)

The operating principles and adaptation of various control techniques within the iron and steel industry are examined. The major emissions and sources within the industry include grit, dust, and sulfur dioxide emitted during sintering in the blast furnace; particulates, smokes, and gases (carbon monoxide, ammonia, SO2, hydrocarbons, and organic compounds) from coking plant operations; grit and drizzle from hot coke quenching; carbon monoxide, iron ore, sinter, and coke particles from blast furnaces; iron oxide fumes and smokes in the steelmaking process; sulfur dioxide, dusts, and fumes from open hearth furnaces; basic oxygen furnaces; and electric arc furnaces. Cleaning and control processes and equipment for these processes include electrostatic precipitators, low sulfur fuels, higher stacks for greater dispersion, temperature control, hoods, shroud exhaust systems, cyclones, dust collectors, flares, good maintenance, wet scrubbers, baffles, gas washing towers, bag filters, rapping mechanisms, exhaust fans, and process modifications.

40497

POLLUTION CONTROL AGREEMENT. NO. 5, KANAGAWA PREFECUTRE, YOKOHAMA CITY, KAWASAKI CITY, AND NIHON KOKAN KEIHIN REFINERY POLLUTION CONTROL AGREEMENT. (Kogai boshi kyotei (5) Kanagawa-ke Yokohama-shi, Kawasaki-shi to Nihon Kokan (kabu) Keihin seitetsujo no kogai boshi kyoteisho). Text in Japanese. Kogyo Ricchi (Ind. Location), 10(8):51-53, Aug. 1971. (Includes POLLUTION CONTROL AGREEMENT BETWEEN ONE-PREF-TWO CITIES AND THE STEELWORKS: WILL THE WHITE CLOUDS RETURN TO THE SKY OF THE AREA? (Ikken nishi tai kokan kogai boshi kyotei - fukugen naruka, chiiki no sora no shiroi kumo). Text in Japanese. Toshi Kaihatsu (Urban Development), 1971:82-84, Nov. 1971.) With the proposed move of Nihon Kokan (Japan Steel Pipe Industries) Kawasaki Refinery to the landfilled Ogi Island in Tokyo Bay, Kawasaki and Yokohama cities are expected to be victimized by the refinery s pollution more than ever. Agreements were signed between Kanagawa Prefecture, Yokohama and Kawasaki cities, and Japan Steel Pipe concerning protection of environment and citizens health. According to the agreement, the major part of the refinery operation will be concentrated to two large blast furnaces (capacity of producing 6 million tons/yr of crude steel) which will be completed by 1978. For specific pollution control, the refinery will use fuels containing less than 0.5% sulfur at the present location, less than 0.65% sulfur fuel for an electric power generator boiler, and with blending of gas fuel, an average of 0.7% sulfur content fuel for the total area should be achieved. Coke furnace gas fuel should be desulfurized to less than 0.02% content; ground concentration of sulfur oxide in a 2 m velocity south wind should be less than 0.015 ppm; the maximum total emission of 770 N cu m/hr should be maintained but efforts should be made to reduce it to 650 N cu m/hr of less than 0.012 ppm sulfur oxide concentration. For sintering material, sulfur content should be less than 0.15% and more than 50% actual desulfurization should be achieved for stack gas. With regard to dust emissions, maximum standards ranging from 0.005 to 0.1 g/N cu m are designated for various emission sources, and methods of dust control are suggested.

41042

Balanov, V. G., R. I. Davidzon, and V. F. Kossovskiy

VENTILATION OPERATION IN DRY EXTINGUISHING COKE PLANTS. (Rabota ventilyatsionnykh ustanovok USTK). Text in Russian. Koks i Khim., no. 3:50-51, 1972.

Improvements in air pollution control techniques at a USSR coke plant are described. Both carbon monoxide and dust concentrations were high when exhaust fans with cyclones were applied, and the air ducts and cyclones were damaged by dust and sulfur compounds, respectively. Therefore the exhaust fan was replaced by a blower, and a scrubber with lined plate, using diabase solution, was found to be the most reliable cleaning equipment. The scrubber, with an efficiency of 90%, had a life expectancy of 5-6 years. The air duct following the scrubber required systematic cleaning weekly, but rubberizing the ducts extended their life. Sectional exhaust fans with dry cyclones should be designed for new coke feed conveyors.

41447

Ievlev, V. V., V. I. Litvinenko, and S. N. Lazorin

SULPHUR LOSSES IN SULPHUR REMOVAL PLANTS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 10:49-51, 1971. 5 refs.

Both the arsenic-soda process and the vacuum-carbonate process to extract hydrogen sulfide from coke-oven gas need further development to reduce the level of air and water pollution produced and increase the output of sulfur and sulfuric acid. The liquid effluent produced by an arsenic soda plant is rich in sulfur- containing sodium salts and is reused in the quenching of coke. The coke thus produced is enriched in sulfur 0.1% and enriched in ash 0.4%. In the arsenic-soda process, 9000 t of sulfur and 31,000 t of sodium thiosulfate, sulfate, and thiocyanate are lost annually. Equipment to reclaim these saleable compounds from salts in the effluent would also increase the value of the coke by reducing the sulfur and fly ash content. In the vacuum-carbonate process, SO2 and SO3 loss is mainly due to inefficient oxidation in the wet catalytic plant. Improved catalytic oxidation, more intense spray irrigation in the condensation towers, and improved electrostatic precipitators are needed.

42024

McManus, George J.

HEAT OF POLLUTION DRIVE HITS THE COKE OVEN. Iron Age, 209(26):77- 80, June 29, 1972.

Despite emissions control deadlines and commitments, steel men say it will be physically impossible to achieve an overnight cleanup of coke ovens. The two domestic builders of complete ovens could not handle all the projects resulting from a crash program. Until recently, new construction had been held up by the uncertainty of the regulations concerning acceptable emissions levels. A number of recently installed systems for charging, pushing, and quenching in the coke oven process are described. Systems have been installed which can eliminate 93% of the hydrogen sulfide emission and yield elemental sulfur or sulfuric acid. Substitutes for coke, including briquettes from powdered coal and gas injection are under consideration in Japan.

43752

Harima, Mikio

AMMONIA ABSORPTION, PHOSAM PROCESS. (NH3 kyushu, PHOSAM purosesu). Text in Japanese. Aromatikkusu (Aromatics), 24(1):26-31, 1972.

A new process for ammonia gas removal is described. Ammonium phosphate solution is used as the absorbing agent in the so-called Phosam process. The absorbent is sprayed from the top of the absorbing tower in a counterflow direction to the incoming coke oven gas (COG) which has just emerged from a primary cooler, exhauster, and a gas purifying tower in which solid content, moisture, and tar of the COG are removed. More than 98% of the NH3 is removed in the absorbing tower. The resulting solution is then led to a separator to which hot steam is supplied and ammonia water is separated from the phosphate solution which is recycled to the absorbing tower. Anhydrous ammonia gas is generated at high pressure by introducing steam into the ammonia fractionation tower. The pressure loss of the absorbing tower is designed at 100 to 150 mm Aq, and the process can be designed for any desired gas feed, NH3 recovery, and product purity.

43840

Hemming, Charles

WHAT INDUSTRY IS DOING ABOUT POLLUTION CONTROL. Civil Eng. (N. Y.), 41(9):59-62, Sept. 1971.

Developments in air and water pollution control by five major industries are reviewed. Hercules, Inc. is constructing an advanced solid-waste reclamation plant in Delaware that will convert 500 tons of refuse and 70 tons of sewage sludge/day into marketable products. Dow Chemical Company has a number of projects underway at its Midland, Michigan, Division, including brine purification, the installation of detection devices on sewers, and environmental monitoring in the form of a specially designed van which tours potential trouble areas around the plant. Alcoa has perfected a system for recycling fluoride effluents in smelting operations. The fumes given off in a aluminum smelting, heavy with particulate and gaseous fluorides, are ducted through a bed of alumina which chemisorbs the gaseous fluoride. Particulate fluoride is captured in filter bags. Recovered fluorides are recycled to potline cells where they contribute to the continuous smelting process. The Alcoa 398 Process is more than 99% efficient in recovering potential pollutants. General Motors is active in planning abandoned-car cleanup campaigns. Allied Chemical Corporation has developed a pipeline-charging system that controls air pollution resulting from coke ovens by reducing smoke and gases from by-products by as much as 70%.

44156

Amstislavskii, D. M., N. O. Panteleenko, and I. E. Matveeva

CORROSION PROTECTION OF SULFUR REMOVAL REGENERATORS. (Zashchita ot korrozii regeneratorov tsekha seroochistki). Text in Russian. Koks. i Khim., no. 3:53, 1972.

The interior surface of the regenerator used for removal of hydrogen sulfide from coke oven gases was cleaned by sand blasting, then protected by a 4-coat system of primer, filler, and two top coats, all based on an epoxide resin. A finish, containing 70% epoxide resin and 30% coal tar, hardened with 8% polyethylenepolyamine (calculated on the weight of resin), and containing aluminum oxide as filler, was also used.

44989

Nicolau, Matei

AIR POLLUTION CONTROL ON THE WORKING PLATFORMS OF COAL CARBONIZATION PLANTS. Dept. of Commerce, Washington, D. C., Bureau of International Commerce, Environ. Control Sem. Proc., Rotterdam, Warsaw, Bucharest, 1971 p. 292-297. 5 refs. (May 25-June 4.) NTIS: PB COM-72-50078; GPO

Three types of technological processes cause air pollution on the coal carbonization installations of siderurgical combines. They are lateral charging of coal blocks into the pyrogenation chambers of the coking batteries; quenching the incandescent coke; and tar removal from the raw coke gas collectors. Charging coal into the coking oven may be performed without the generation of raw coke gas (smokeless charging of coal pyrogenation ovens). The technological process of dry cooling incandescent coke eliminates air pollution and, compared to the conventional coke quenching method, presents two important economic advantages, i.e.: the possibility of recovering the physical heat of the incandescent coke subjected to cooling; and qualitative improvement of the cooled coke. Dry cooling of the coke results in a more uniform coke grain size and in a higher mechanical strength of the coke. According to solutions proposed in Romanian patents, the hot inert gas is first cleaned before it enters the heat transfer system. The problem of removing tars from the raw coke gas collectors has not yet found an optimum solution on a worldwide scale. An optimum installation leading to the solution of the problem must achieve efficient cleaning of the tar masses and tars and their optimum removal from the raw coke gas collector, while maintaining perfect tightness of the entire system. It should use an auxiliary fluid medium, circulating through the collector, which

should be easily recoverable. The installation must present complete operating safety. It should not compromise the coking process. It should enable the automation of the entire tar mass cleaning and removal process from the collector. It should require minimum investments and operating costs.

45308

Pakter, M. K., E. Ya. Eidelman, and A. T. Pozhidaev

GERMANIUM AND SULPHUR DISTRIBUTIONS IN COKE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 4:31-35, 1971. 11 refs.

The distributions of germanium and sulfur in coke were investigated in the hope of finding ways of transferring more germanium and sulfur to the recovery products. The germanium content of coke increases from the bottom to the top of the cake, while both the germanium and sulfur contents increase outward from the axis of the side walls. There is little significant variation in either element along the coke oven or in the vertical sulfur distribution. The observed germanium and sulfur distributions are brought about mainly by local carbonization temperature conditions, thus indicating the feasibility of recovering more germanium and removing more sulfur from the coke by moderating the longitudinal and vertical temperature gradients in the cake. There is little hope that significant changes can be brought about by reducing the width of coke ovens. (Author conclusions modified)

45324

Kazmina, V. V.

REDUCING THE SULPHUR CONTENT OF COKE BY HIGH-TEMPERATURE HEATING. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 6:25-28, 1971. 3 refs.

The heat treatment of any size fraction of coke at temperatures between 1300-1600 C leads to a reduction in its sulfur content. The optimum holding time for calcination at temperatures of 1300 C and higher is 30 min. The smaller size fractions of coke lose higher proportions of their sulfur since the pieces are smaller and have a larger specific surface area. Sulfidic sulfur is most completely removed at the lower calcination temperatures, while higher proportions of organic sulfur are removed as the temperature is raised. The sulfur content of large blast furnace coke fractions can also be reduced by calcination at 1300-1600 C. When coke is calcined its reactivity is significantly lowered. The hardness of the coke increases as the calcination temperature is raised. (Author conclusions modified)

45426

Belonozhko, A. M.

COKE AND CHEMICAL PRODUCTION WASTES AND WAYS OF USING THEM. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 9:48-50, Sept. 1971. 8 refs.

Wastes from coke and chemical plants are a serious loss which can damage the national economy and cause problems of air, water, and soil pollution. Solid wastes include clinker, dirt, flotation tailings, lime sludge, and coal waste. The existing dumps are approaching saturation. More use must be made of clinker for road building; coal wastes can be gasified; coal sludge can be incorporated into carbonization charges; and alternatives can be used instead of lime. Recommendations are presented for producing useful chemicals from still bottoms and solar oil. Further work is required on uses for sulfuric acid and alkaline wastes which are regularly dumped by chemical works. Waste chemicals from arsenic-soda sulfur removal plants, vacuum-carbonate sulfur removal plants, and wastes in the form of ammonium sulfate solution and tar liquor are presently being utilized in the production of industrial chemicals.

45658

Mityushkin, V. G. and V. I. Var yev

MODIFICATION OF THE COKE GAS PURIFICATION ELECTRICAL FILTER DESIGN. (Rekonstruktsiya elektrofil tra dlya ochistki koksovogo gaza). Text in Russian. Koks i Khim., no. 4:38-39, 1972.

A modified electrical filter design for use in cokeries for the separation of tar from coke gas is described. The hermetically sealed cylindric electric filter provides possibilities to minimize electricity and heat consumption, to simplify maintenance procedures, and to stabilize the temperature of the insulators. The hermetically sealed design was made possible by applying two coupled insulators, the upper one of which is sealed by mastic, as well as by mounting the suspension insulators for the discharge electrodes frame inside the electrostatic filters. To avoid tar condensation on insulators, the latter are placed in the center of the gas flow.

45688

Sieu, Ho and Piotr Wasileswski

USE OF FOAM COLUMNS FOR ABSORPTION OF AMMONIA FROM COKE OVEN GAS IN AQUEOUS AMMONIUM DIHYDROGEN PHOSPHATE SOLUTIONS. (Proba zastosowania kolumny pianowej do absorpcji amoniaku z gazu koksowniczego w wodnym roztworze fosforanu jednoamonowego). Text in Polish. Koks, Smola, Gaz, 17(3):76-81, 1972. 15 refs.

Because of a much higher contact surface between the gas and the liquid, foam columns give much better results in ammonia absorption than the usual sieve-plate columns or columns with pneumatic mixing. The performance of an experimental column for ammonia absorption with an aqueous solution of ammonium dihydrogen phosphate solution is described. The column (1080 mm high) had three plates and was operated with foaming of the solution with an ammonia-air mixture. The effect of foam-layer thickness on the absorption coefficient and the absorption degree were determined. Very high values of the absorption coefficient and the absorption degree were obtained. At a gas-mixture velocity of 0.8 m/sec, the absorption coefficient was 10.4 kg/(cu m)(hr)(g/cu m), and the absorption degree was 93.4%. Increase in gas quantity leads to increase of flow rate, absorption coefficient, and absorption degree, and to a decrease of salt concentration in solution after completion of the absorption process.

46441

Helling, S. and H. Eckhardt

DEVELOPMENT OF A METHOD FOR STABILIZING THE TAR FROM SOFT COAL HIGH TEMPERATURE COKING. (Entwicklung eines Verfahrens zur Stabilisierung des bei der Braunkohlenhochtemperaturverkokung anfallenden Teeres). Text in German. Freiberger Forschungsh. A, 507:47-59, 1972. 5 refs.

The tar obtained from high-temperature coking poses considerable difficulties if used as fuel oil. Through its instability, solid matter separates during storage and incrustations are formed at the combustion. Its low sulfur content of 0.4% would make it an ideal fuel, however. It was possible to improve the thermo-chemical stability of the tar considerably.

The most economical and most favorable method turned out to be the gassing the tar with ammonia. Further study of this method showed that iron as material for the gassing column has a negative effect on the stabilization. Glass, chromium-nickel steel or enameled iron are better materials. With the ammonia-gassing method, a low-sulfur fuel oil can be obtained which has the stability of conventional fuel oils.

46642

Weber, Heinrich and Kurt Tippmer

COKING PLANT GASES TREATMENT BY SCRUBBING WITH AMMONIA VAPORS TO REMOVE HYDROGEN SULFIDE. (Verfahren zum Entfernen von Schwefelwasserstoff aus Kokereigasen). Text in German. (Assignee not given.) Ger. Pat. 1,494,815. 5p., April 20, 1972. (Appl. Oct. 1, 1970, 2 claims).

Ammonia scrubbing vapors are introduced to a hydrogen sulfide stripper column at several points to remove hydrogen sulfide from coking plant gases. The NH3 vapors are introduced preferably at 40-45 C, above the packing of the H2S stripper column top.

46945

Volkov, E. L., V. Ya. Deev, and T. M. Roslyakov

A PILOT COMMERCIAL SPRAY-TYPE ACTIFIER FOR H2S REMOVAL. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 4:45-46, 1971.

The extent to which hydrogen sulfide is removed from coke oven gas depends in large measure on the performance of the regeneration plant. The foul liquor from vacuum carbonate H2S absorbers is actified in towers fitted with tunnel and capped plates. Degree of actification is basically dependent on the temperature of the liquor to be treated, which in turn is determined by the residual pressure in the equipment and its detailed design. A pilot commercial spray-type actifier tower is described, including operating experience. The actifier consists of a thermally insulated tower fitted with internal nozzles through which the liquor is sprayed. Two slotted baffles divide it into three sections.

46946

Volkov, E. L., V. Ya. Deev, and T. M. Roslyakov

UTILIZATION OF HEAT FROM THE TAR LIQUOR IN THE COLLECTING MAIN. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 4:47-48, 1971.

Large amounts of energy are consumed in the removal of hydrogen sulfide from coke oven gas with alkaline solutions. However, the economics of sulfur removal can be improved by utilizing waste heat from other parts of the plant. The liquor temperature required in the actifier is no higher than 65-70 C. A process is described whereby sensible heat from the tar liquor in the collecting main is used to heat the foul liquor from the absorbers. Design of the waste heat recovery unit is indicated.

47110

Edgar, Wm. D.

COKE-OVEN AIR EMISSIONS ABATEMENT. Iron Steel Engr., 49(10):86-94, Oct. 1972. 7 refs.

Sources of coke-oven emissions, types of emissions and controls, pipeline charging of preheated coals to coke ovens, oven pushing, and coke quenching are considered. Gas scrubbers, incinerators, exhaust systems, and various collection system requirements are indicated. In addition to the reduction or elimination of coke-oven emissions, some plants are improving the operator s environment, either by providing better working conditions or by eliminating certain operating jobs. Perhaps the worst environment is encountered by the lidman on top of the battery, and current laws require the use of respirators by all top-side personnel. While the systems or modifications of systems as described will be adaptable to most plants, other operators are looking toward other processes, such as form-coke or direct reduction, which will eliminate the need for by-product coke ovens and, in the latter case, blast furnaces.

47794

Weber, Heinrich, Gustav Choulat, Helmut Fritzsche, and Dieter Laufhuette

AMMONIA DISPOSAL FROM COKE OVEN GASES. (Verfahren zur Verbrennung oder Zersetzung des bei der Aufbereitung von Kokerei- oder Gaswerksgas anfallenden Ammoniaks). Text in German. (Firma Carl Still, Recklinghausen (West Germany)) W. Ger. Pat. Appl. 2,054,336. 7p., Nov. 5, 1970. 7 refs. (6 claims).

A technique for the removal of ammonia from coke oven gases by absorption in sulfuric acid, ammonium bisulfate, or ammonium phosphate, mono basic, is presented. The resulting solutions are thermally decomposed to produce NH4HSO4 or NH4H2PO4, respectively, which are recycled to the absorption process and NH3. The NH3 is burned with air or thermally decomposed by passing its mixture with combustible gases and air through a decomposition zone. The gases leaving this zone are burned completely with air or are used for leaning of calorie-rich gases. The combustion heat is used for the thermal decomposition of the substances from the NH3 absorption. The combustion gases are free of products from hydrogen sulfide or hydrogen cyanide combustion.

C. MEASUREMENT METHODS

03233

W. Thurauf and W. Ehnert

((THE FORMATION OF NITRIC OXIDE DURING COKING.)) Uber die Bildung von Stickstoffmonoxid bei der Verkokung und seine Bestimmung in Koksofengas. Brennstoff-Chem. (Essen) 9(48):270-273, Sept. Translated from German as JPRS R-8582-D.

Experiments were undertaken in order to settle the question of where and when nitric oxide is formed during the coking process, and the manner in which the nitric oxide content of coke oven gas changes during the process of coking. The experiments were conducted on a small scale, employing specially designed apparatus with the thermal energy being provided by an electric heater, in order to eliminate the possibility that coking fuels are responsible for the formation of nitric oxide. It was found that nitric oxide begins to form during the first state at which gas is driven off; and that the extent to which it continues as the temperature is raised depends on the type of coal, its granular structure, and the temperature rise. Formation appears to be complete by the time that the coking coal reaches a temperature of 400 C. In the case of ground coals, the finer the grains the lower the formation of nitric oxide, and vice versa; the reverse being true for coal dust obtained by sifting coal that had been stored in the open air. The NO contents of subsequently heated alcohol extracts from coals are approximately the same as those of the same coals directly heated in a helium atmosphere, and are from four to twelve times as great as the volumes contained in the distillation gases obtained during the coking process. This indicated that approximately 90% of the NO which is formed during coking is subsequently decomposed by reactions with the other distillation products. NO is not formed, as formerly believed, through oxidation during coking, but rather from the decomposition of substances which are formed when coal is stored in the open air.

06653

Razbegaeva, A. P.

MECHANIZATION OF THE GAS ANALYZER ORSAT. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 44-7, 1962. (Koks i Khim.) (4) 53-4, 1958. Translated from Russian. CFSTI: 62-11103

A method for mechanical transfer of the combustion gases from the burettes into the absorption tubes is described. The apparatus consists of a water pressure flask and a rubber bulb or balloon which form an assembly unit. Each rubber bulb is operated by a spring type pusher activated by one of several eccentric cams on a common shaft. The cams are set so that at a given time interval only one pusher is brought into action. Results of tests made with gas analyzer ORSAT manually and by the automatic procedure show that differences between testing procedures were within error limits normal for an apparatus of this type. Adoption of the mechanical procedure of combustion gas analysis facilitated the work of the laboratory technicians, increased their productivity, and freed one technician for other laboratory work. The apparatus is now in continuous smooth operation.

06908

R. V. Gorskaya

DETERMINATION OF PYRIDINE IN AIR. (K voprosu ob opredelenii piridina v vozdukhe.) Hyg. Sanit. (Gigiena i Sanit.) 30 (12), 393-6 (Dec. 1965). Russ. (Tr.)

The determination of pyridine in factory air was accomplished by the reaction of pyridine with cyanogen chloride and borbituric acid. The method was tested under industrial conditions to determine pyridine concentrations in the air of the pyridine shop of a coking-chemical plant. Parallel determinations were made by the gas laboratory of the plant using cyanogen bromide and aniline. A comparison of the results show that the determination of pyridine with cyanogen chloride and barbituric acid makes quantitative results possible, while the method used by the laboratory does not. This method also eliminates work with highly toxic reagents, is convenient for routine analysis under industrial conditions, and possesses high sensitivity and accuracy.

08335

Richards, Ronald T., Therese Donova, and Jack R. Hall

A PRELIMINARY REPORT ON THE USE OF SILVER METAL MEMBRANE FILTERS IN SAMPLING FOR COAL TAR PITCH VOLATILES. Am. Ind. Hyg. Assoc. J., p. 590-594, Nov.-Dec. 1967. 2 refs.

A method is developed for collecting and analyzing samples for coal tar pitch volatiles by using a silver metal membrane filter and benzene extraction. The collection of a 1-cubic-meter air sample and the use of a five-place analytical balance accurate to 0.01 mg provides adequate sensitivity to detect 0.10 mg of coal tar pitch volatiles per cubic meter of air. Background information concnerning reasons for the initiation of this study, the tentative threshold limit of 0.2 mg per cubic meter of air (ACGIH), and previous attempts at sampling with glass fiber filters are also discussed. Problems encountered in obtaining consistent results with glass fiber filters and the benzene extraction analysis technique led to a search for a better technique. Comparison of glass fiber filters, cellulose acetate membranes, cellulose filters, and cellulose thimbles with the silver membranes were made. This comparison included weight stability with humidity changes and benzene extraction and airflow determinations. The results of actual sampling are listed, and other possible uses of the metal membrane in industrial hygiene are discussed. (Authors' abstract, modified)

10671

Herrick, Robert A. and Louis G. Benedict

A MICROSCOPIC CLASSIFICATION OF SETTLED PARTICULATES FOUND IN THE VICINITY OF A COKE-MAKING OPERATION. Preprint, Bethlehem Steel Corp., Pa., Coal and Coke Section, 23p., 1968. 8 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 1968, Paper 68-137.)

The specific identification of the components of settleable particulate samples collected near a coke-making operation was

accomplished. The identification technique employed is a new application of reflected-light microscopic examination of polished sections of the material. The inherent optical characteristics of the individual particles are utilized to classify them as coal (high-, medium- or low-voltatile), coke (coke balls, pyrolytic carbon, slot-oven coke and char), fly ash or mineral matter. The application of this method of analysis is unique in that classification of particles is based on these inherent optical properties and not on shape, color or other subjective criteria. This microscopic classification technique is based on accepted methods and should be generally applicable by petrographers on the basis of the photomicrographs and the detailed procedures which are included. On the basis of the data obtained during a six-month study near a coke-making operation it is concluded that material handling and stockpiling operations are major contributors to settled particulate deposition, while coke oven charging was not a major source. This study has shown that a broad program of engineering control will be required to significantly reduce settled particulate deposition in the immediate vicinity of a coke-making operation. (Authors' abstract, modified)

24621

Khalaimova, A. M., M. F. Kovalenko, and Ye. A. Zherdeva

DETERMINING THE COMPOSITION OF RAW BENZENE BY GAS-LIQUID CHROMATOGRAPHY. (Opredeleniye sostava syrogo benzola metodom gazozhidkostnoy khromatografii). Text in Russian. Koks i Khim., no. 6:35-37, 1970. 5 refs.

Results of gas-liquid chromatography of raw benzene derived from coke-oven gas are presented. The benzene content was 3-6% higher and xylene content 1-2% higher than indicated by fractional distillation. Blast-furnace coke contained 8-10% more total raw benzene than foundry coke, but less of the following constituents (% abs.): toluene, 3-4; xylene, 2; carbon disulfide, 0.4; and pseudocumene, 0.5.

25030

Masek, Vaclav

THE USE OF SILVER MEMBRANE FILTERS IN SAMPLING FOR COAL TAR PITCH VOLATILES IN COKE OVEN PLANTS. Am. Ind. Hyg. Assoc. J., 31(5): 641-644, Sept.-Oct. 1970. 3 refs.

The application of silver metal membrane filters is recommended to establish the concentration of benzene soluble fractions in the workplace atmospheres of both black-coal and coal-tar pitch coke oven plants. Long-term induction of air through Soxhlet Schleicher-Schull filters yielded enough of the pollutants for analysis when placed 1.5 meters above floor level at seven sampling points. Determinations were made of the ash content and total iron and silicon oxide concentrations in the ash, while the size distribution curve was established, first on a sieve set and then by optical microscopy. The content of benzo(a)pyrene was ascertained by chromatography, and the content of benzene-soluble fractions was determined in a Soxhlet apparatus. Using the colloidal membrane technique, the finest of the separated impurity particles were photographed under a Tesla BS 249 electron microscope. When twelve silver metal membrane filters of 37 mm and 47 mm diameters with a porosity of 0.0008 mm were made available, Soxhlet extraction was ended after five cycles of spectrographic grade benzene. About 250 ml of extract was first evaporated down to some 20 to 30 ml and then filtered through a silver metal membrane filter of 47 mm diameter into a tarred container. The filter was then rinsed with 10 to 20 ml of benzene, and the container was evaporated dry at room temperature. However, the pollution values thus established are not always a reliable measure of the actual carcinogen danger encountered in black coal coke oven plants.

29157

Schulze, Volker

GAS CHROMATOGRAPHIC OPERATING AND PRODUCT CONTROL IN A COKING PLANT. (Gaschromatographische Betriebs- und Produktenkontrolle in einer Kokerei). Text in German. Gas Wasserfach (Munich), 112(4):179-182, 1971.

Gas chromatography is used in coking plants for analysis of hydrocarbon gases. This method has the advantage that a clear distinction can be made between benzene and benzene hydrocarbons. Initially, gas chromatography was used to study connections between the composition of new types of gases and soot depositions. Small concentrations of carbon monoxide in the presence of considerable nitrogen are not accurately separated by gas chromatography unless duration of analysis is more than 20 min. For operating control, gas chromatography is indispensable. Direct naphthalene determination by gas chromatography without enrichment has not yet been carried out satisfactorily.

37217

Institution of Gas Engineers, London (England)

RECOMMENDED ANALYTICAL METHODS FOR GAS WORKS AND COKE OVEN EFFLUENTS. Inst. Gas Eng., Commun., 831(2):1-30, Dec. 1970. 7 refs.

Methods are given for the determination of nitrate, sulfide, thiosulfate, total chromium and chromate, iron, nickel, and potassium in effluents from gas works and coke ovens and for preliminary treatment before analysis for metals in the effluents. The methods are colorimetric (nitrate, sulfide, total chromium and chromate, iron, nickel); precipitation (sulfide); polarographic (thiosulfate); iodimetric (thiosulfate); flame photometry of spectrophotometry (potassium); and the nitric acid/sulfuric acid and nitric acid/perchloric acid methods for preliminary treatment.

38361

Plankert, Manfred

THE DETERMINATION OF ORGANICALLY BOUND SULFUR IN COKE OVEN GAS. (Zur Bestimmung des organisch gebundenen Schwefels im Koksofengas). Text in German. Gas Wasserfach Gas Erdgas (Munich), 113(2):65-69, Feb. 1972. 12 refs. (Presented at the Erfahrungsaustausche der Gas-Chemiker, Konstanz, West Germany, 1971.)

Since the concentration of organic sulfur in gas has been limited an analytical method had to be found which permits a fast and accurate determination in the cleaned and uncleaned gas. A combination of the reduction method with the Draeger indicator tube for hydrogen sulfide was tested. The gas sample is passed through a cadmium acetate solution where the H_2S is retained. A certain measured volume is then passed over a platinum catalyst at 1000 C. The organic sulfur is entirely converted to H_2S at this temperature, provided the hydrogen concentration and the residence time at the catalyst are sufficiently large. The apparatus consists of the gas entrance section, the measuring buret, the reactor and the indicator. The gas entrance section has a scrubber. The reactor is composed of a quartz tube with a length of 150 mm and a diameter of 10 mm. A sample volume of about 300 ml suffices for the determination, the whole measuring process lasts less than 5 min. Reproducible values were obtained which agreed well with the results of parallel measurements by the method of Roelen/Feisst.

41644

Khalyapin, S. A. and A. E. Mironov

RADIOMETRIC DETERMINATION OF SULPHUR IN GASES. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 10:52-54, 1971. 4 refs.

A radiometric method for the determination and in-process control of sulfur in streams of gases generated by coke and chemical plants is described. The radiometry principle is based on the relationship between soft gamma-ray absorption and the atomic number of the absorbing element. The on-stream gas analyzer for sulfur determinations is based on the use of a compensating source and beam amplitude modulation. Radiation from two sources passes through the working and comparison channels in the analyzer. The working channel includes an on-stream gas cell, while the comparison channel includes a compensating slide. The rotating shutter alternately exposes the single detector, which consists of a scintillation counter and a photoelectric multiplier, to the two beams. When the beam intensities in the working and comparison channels are different, the alternation produced by the shutter leads to an alternating current signal at the output of the system controlling a reversible motor. The amplitude of the signal driving the meter is proportional to the sulfur content of the gas to be analyzed. A prototype analyzer was tested at a coke and chemical works and the instrument readings were evaluated by comparing them with the results of simultaneous chemical analyses on the sample gas. A t-test was applied to confirm that there was no systematic difference between the two sets of results. The trial results obtained with the prototype analyzer were fully in accordance with the theoretical principles on which the procedure was based.

D. AIR QUALITY MEASUREMENTS

08485

Masek, Vaclav

THE EFFECT OF SOLAR RADIATION ON THE PRESENCE OF 3,4-BENZOPYRENE IN INDUSTRIAL EXHAUSTS. ((Vliv slunecniho zareni na pritomnost 3,4-benzpyrenu v exhalacich.)) Text in Czech. Chem. Prumysl (Prague), 17(2):99-103, 1967. 30 refs.

The determination of polycyclic hydrocarbons in industrial exhausts and in the atmosphere has become increasingly important in recent years. The main interest is focoused on carcinogenic substances, particularly on 3,4-benzopyrene. In the present study, 3-4-benzopyrene was determined from samples obtained by passing air through filter paper in the vicinity of a coking plant in which coal tar products formed during carbonization leak into the atmosphere. At the same time the intensity of solar radiation was recorded with a Robitzsch pyranograph. The results showed that the intensity and duration of solar radiation had no effect on the content of 3,4-benzopyrene in the atmosphere and in the dust in the vicinity of the source. The discharge of tar products into the atmosphere must be controlled by changing the technology, e.g. by improving equipment seals and using steam injection to reduce the vapor pressure inside the equipment. Tables and graphs.

11015

Tanimura, Hisashige

BENZO(A)PYRENE IN AN IRON AND STEEL WORKS. Arch. Environ. Health, 17(2):172-177, Aug. 1968.

To investigate benzo(a)pyrene in an iron and steel works, separating and measurement methods were studied, and amounts of benzo(a)pyrene contained in suspended and falling particulates were collected in the plant and measured for summer and winter sessions. The samples were separated chromatographically and the amounts were determined spectrophotometrically. A great amount of benzo(a)pyrene was found near the three high mills in the rolling mill plant, the coke oven, the blast furnace, and the electric furnace. High correlations were found between benzo(a)pyrene in suspended and falling particulates. (Author's abstract)

21239

Dikun, P. P. and I. I. Nikberg

INVESTIGATION OF ATMOSPHERIC POLLUTION WITH 3:4-BENZPYRENE IN THE VICINITY OF PITCH-COKE OVENS OF OBSOLETE PATTERN. Probl. Oncol. (USSR) (English Translation from Russian of: Vopr. Onkol.), 4(6): 32-38, June 1958. 6 refs.

The results of an analysis of three sets of samples taken from the vicinity of an obsolete pitch-coke oven, at various times, at various distances from the works, and at points lying at various directions away from it are given. The first series were of deposits of dusts; the second series were of sedimentation samples; and the third series were of aspiration samples. The analysis of all three samples showed that exceptionally large amounts of carcinogenic hydrocarbons, in particular 3,4-benzpyrene, escaped into the surrounding area. Subsequently, on special government instructions aimed at ensuring a healthy atmosphere, the coke ovens were equipped with special devices to provide additional combustion of exhaust gases. Analysis showed that after reconstruction of the coke ovens, atmospheric pollution in the vicinity of the pitch-coke works sharply diminished.

26040

Kettner, H. and V. Masek

DUST AND SOOT NUISANCES AT A METALLURGICAL COKING PLANT AND IN ITS ENVIRONMENT. (Ueber Staub- und Russbelaestigungen auf einer Huettenkokerei und in derer Umgebung). Text in German. Gesundh. Ingr., 91(11):323-326, Nov. 1970. 7 refs.

The maximum permissible dust emission in West Germany for inhabited areas is 0.42 g/sq m/day as an average of 12 monthly averages. For industrial areas, the tolerated level is higher, 0.85 g/sq m/day as an average of 12 monthly averages. In Czechoslovakia, the respective levels are 150 t/sq km/year for inhabited areas, and 10 mg dust/cu m for industrial areas. Gravimetric dust emission measurements performed at 19 sites of a coking plant and in its vicinity near Ostrava in Czechoslovakia yielded levels which by far exceeded the stipulated norms; in one case, a daily emission level of 11.3 g/sq m/day was recorded. The maximum 3,4-benzpyrene content found was 38.5 micrograms/g dust. The dust consisted of coke and coal particles and of soot flakes. This emission resulted even though the coking plant met all waste gas purificatio requirements prescribed by law. Thus, additional measures will have to be instituted to reduce dust emission, especially during the charging operations of coke ovens.

27406

Beeckmans, I. and R. Dewaef

STUDY OF ATMOSPHERIC POLLUTION RESULTING FROM METALLURGICAL ACTIVITY, 1961-1967. (L'etude de la pollution atmospherique due l'activite siderurgique, de 1961 a 1967). Text in French. Tribune Cebedeau, 22(303):68-75, Feb. 1969. 1 ref.

An analysis was made of a number of studies of pollution in the industrial areas of Belgium, including studies of emissions from ore concentration, coke, and steel plants in terms of particulate and gaseous pollutants, qualitative and quantitative analyses of gaseous and particulate pollutants, and morphological and granulometric analyses of the solid-state material, the methods of dispersion of waste materials, and the pollution content of the soi and atmosphere within a radius of 5 kilometers from the emission sources. The influence of large-particled solid pollution extends to a radius of more than 2 kilometers from an ore concentration plant and more than 1.5 kilometers from a coke plant. Finer particles are found about 1500 m from ore concentration plants, while the range for sulfur dioxide is 1000 m. Pollution data on large and fine particulate substances, SO2, and nitrogen dioxide are extensively analyzed for the Charleroi and Liege areas, both in the Meuse Valley,

and a comparison is made with figures from the United States, England, Italy, France, and Hungary.

29257

Hall, D. A. and G. R. Nellist

ATMOSPHERIC POLLUTION AT MODERN COKE WORKS. Coke Oven Managers Yearbook, 1964, p. 96-114. 8 refs. (Presented before the Coke Oven Managers Association Northern Section, Nov. 1962.)

Measurements of general atmospheric pollution in the vicinity of three modern coke works are presented. These show that the total solids deposition is much less than in industrial regions and similar to that in an urban area such as Newcastle. The amount of the deposition is only about the same as has been suggested as resonable by a number of authorities. The special problem of grit and drizzle deposition from the quenching tower was studied, and the effect of the installation of wooden baffles at one coke works measured. The results show that the baffles greatly reduce the emission of drizzle but make only a small difference in total emission of solid material, e.g., fine dust. In addition, the eliminators cause coagulation of water droplets and, to a lesser extent, grit, which results in both materials being precipitated nearer to the quenching tower than previously. (Author abstract modified)

35081

Kutuzova, L. N., A. F. Kononenko, and G. P. Sokulskii

DISCHARGES TO ATMOSPHERE FROM BENZOLE PLANT. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim), no. 8:39-42, 1970.6 refs.

Coke and chemical plants pollute the atmosphere with numerous toxic substances, including hydrocarbons and sulfur compounds. Concentrations of benzene, toluene, xylenes, hydrogen sulfide, and carbon disulfide were determined on a chromatograph with a thermal conductivity detector at a benzol refinery. Chemical analyses were carried out simultaneously for benzene (which was determined by the combustion method), hydrogen sulfide (which was determined by an iodimetric method), and carbon disulfide (which was determined by the xanthogenate method). Phenols were determined in the discharge gas spectrophotometrically, and hydrogen cyanide by the tetrathionate method.

38830

Chuang, Tsin-yuan

AIR POLLUTION AND CONTROL MEASURES IN TAIPEI CITY. (Taipei-shih kung-chi wu-jan chih hsien-chuang yu chi kuan-chih tui-tse). Text in Chinese. Kung Ch eng (Eng. J.), 44(8/9):85-109, Aug./Sept. 1971. 22 refs.

Air quality was measured in Taipei city to determine the level of air pollution. The annual average dust fall was calculated at 18.51 ton/sq km/mo with a standard deviation of 6.48 tons; however, 53% of the pollution load, excepting fuel combustion products, is water soluble. Suspended particulate matter from steel mills, brick factories, and coking plants was also measured. Approximate concentrations of 0.06 ppm for sulfur dioxide, 6-8 ppm of carbon monoxide, and 0.026 ppm of nitrogen dioxide were established. Monitored SO2 observations also indicated radiation inversions at certain times of the day. The problems of air pollution are aggravated by the increasing population, 80% of which is concentrated in the urban areas. Meteorologically, the situation is favorable toward dispersion of pollutants, since periods of calm occur only 2.73% of the time and the average annual wind velocity is 3.23 m/sec. Topographic interactions, however, may have adverse influences on wind movements and velocity. The wind direction is generally easterly, thus bringing in pollution from the Nankang and Neihu industries.

38895

Masek, Vaclav

NEWER FINDINGS CONCERNING THE PROPERTIES OF FLY DUST FROM COKING PLANTS. II. THE ARSENIC CONCENTRATION IN THE DUSTS DEVELOPING AT THE COKING PROCESS. (Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil II - Arsengehalt in den Luftstaeuben der Verkokung). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 22(3):69-74, March 1972. 10 refs.

The dust and arsenic concentration in 19 samples taken at the upper floors of the hard coal and pitch blocks of the coke-oven furnace were measured. The soluble arsenic concentration was determined by boiling the sample with 2% sodium hydroxide solution. The total arsenic concentration was determined by a modified colorimetric method. The obtained arsenic was then determined by photometry with silverdiethyl dithiocarbamate. The average arsenic concentration of the raw material was 0.0005% by weight, in the dusts of the air samples it was 0.014% by weight, which means that the arsenic concentration in the emission is 28 times higher than in the initial coal used for the coking process. The dusts in the samples taken in the upper pitch blocks contain an arsenic concentration which is 182 times higher than the concentration in the coal. The quantities of soluble arsenic in the samples were negligible. The maximum allowable arsenic concentration in the air of working places of 0.3 mg As/cu m was never exceeded.

45231

Masek, Vaclav

BENZO(A)PYRENE IN THE WORKPLACE OF COAL AND PITCH COKING PLANTS. J. Occup. med., 13(4):193-198, April 1971. 3 refs.

The results of measurements of the atmospheric content of benzo(a)pyrene (BAP) at some Czechoslovak coking plants are presented. Various methods exist for determining BAP but there is no acceptable standard method, nor in Czechoslovakia is there a hygienic standard. It is hoped that the measurements, taken over a period of 6 years, will help in setting standards. Ways of reducing the health hazards include reducing exhalations by modifying the charging equipment, limiting the time workers spend in a noxious atmosphere, and subjecting all coking plant personnel to regular medical checks. These are only stopgap measures and a more thorough approach is needed for the protection of people living near the plants as well as those working in them.

47099

Masek, Vaclav

NEW FINDINGS CONCERNING THE PROPERTIES OF FLY DUST FROM COKING PLANTS. PART IV. HARD COAL TAR DISTILLATION PLANTS. (Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil IV: Steinkohlenteerdestillationsanlagen). Text in German. Zbl. Arbeitsmed., 22(11):332-337, 1972. 11 refs. Part I. Ibid, 22(2):38-47. Part II. Ibid, 22(3):69-74. Part III. 22(9):276-281.

In three tar distillation plants the benzo(3,4)pyrene concentration in the fly dust was determined. Samples were taken at 20 different points on 566 impregnated Schleicher-Schuell filters with a diameter of 11 cm. The benzo(3,4)pyrene concentration was determined by chromatography. In all samples

benzo(3,4)pyrene was found; the largest quantities in the samples were taken during charging and emptying of the tanks with and from hot pitch. The benzo(3,4)pyrene was found primarily in the fly dust fractions with diameters up to 5 micron.

F. BASIC SCIENCE AND TECHNOLOGY

09930

Khanin, I. M., V. G. Deryugin, I. G. Kuprienko, B. D. Kotlyar, A. V. Gorbunov, A. S. Zoltuev, and B. A. Boltsman

INVESTIGATION INTO THE OPERATING CONDITIONS OF WASTE-GAS FLUES ARRANGED FOR CENTRAL DISCHARGE OF THE COMBUSTION PRODUCTS. Coke Chem., (USSR) (English Translation) (Gomersal), 24(8):19-23, Aug. 1967.

Commercial trials have been conducted at a Siberian coke and chemical works to investigate the operating conditions of the coke oven waste-gas glues in order to verify the experimental results obtained on hydraulic models and the projected, mathematically produced results. The following data have been determined: the resistance coefficients of the smoke outlets on the coke and pusher sides of a coke-oven battery; the resistance coefficient when the streams from the side flues merge at the entrace to the collecting flue; the resistance coefficient when the streams from the side flues merge in the collecting flue; and the degree of loading of the outside and inside half-flues. A comparison of the laboratory calculations with the commercial results indicates a satisfactory level of agreement. The flues are diagramed.

15723

Faingold, S. G., A. M. Stanetskaya, L. A. Tretyakova, and N. S. Kipot

CAUSES OF THE FORMATION OF NITRIC OXIDE IN THE CARBONIZATION OF COALS. Coke Chem. (USSR) (English translation from Russian of Koks i Khim.), no. 2:23-28, 1969. 10 refs.

While confirming that nitric oxide is an inevitable product of coal carbonization, previous research has not established the extent to which carbonization participates in nitric oxide content of coke oven gas or its relationship to the nitrogen content of coal. To resolve these questions, as well as determine the nitric oxide content of coke-oven gas during carbonization, various coal blends and different grades of coal were carbonized in a gas-tight oven chamber at a pressure of 600- 800 mm water gauge. The evolution of nitric oxide followed the same pattern for all blends and coals: the content reached a peak at 200-399 C, the beginning of carbonization, and the peak lasted until 400 C. The quantity of nitric oxide evolved was unrelated to the nitrogen content of the blends and coals. For example, one blend contained 2.36% nitrogen, and the dynamic mean nitric oxide content of the coke-oven gas equalled 2.83-3.67 ppm or 0.96-1.10 ml/kg for the blend. The nitrogen content of the blends ranged from 1.5-2.36%. The nitrogen content of coals varied less and the volatile matter differed sharply, but nitric oxide formation was the same as for blends. It is concluded that nitric oxide is formed as a result of reactions involving the liberation of oxygen from the air, introduced with the blend or coal and the oxygen-nitrogen-containing compounds in the coal.

16623

Ganz, S. N., I. Ye. Kuznetsov and M. A. Lokshin

DETERMINATION OF DIMENSIONS OF HOLLOW TOWERS FOR CLEANING COKE GAS OF HYDROGEN SULFIDE. (K opredeleniyu razmerov polykh bashen dlya ochistki koksovogo gaza ot serovodoroda). Text in Russian. Koks i Khim., no. 9:48-50, 1964. 1 ref.

Data on H2S elimination from coke gas in hollow atomizing scrubbers as previously reported demonstrated the high effectiveness of these devices. It was previously shown that the rate of absorption of H2S by a Na2CO3 solution depends on a set of physico-chemical, hydrodynamical and geometrical parameters. New investigations using a semi-industrial test set up enabled the determination of the effect of each of these parameters on the rate of the absorption process and to representation of the quantitative interrelations among these parameters in terms of dimensionless ratios. An empirical expression was derived using the adsorption-rate coefficient; the diameter of the atomizer; the coefficient of molecular diffusion of a gas in another gas; the rate of rotation of the atomizer; the kinematic viscosity coefficient of the liquid; the velocity of the gas; the kinematic viscosity coefficient of the gas; the coefficient of molecular diffusion of the gas in a liquid; the wetting rate; the concentration of the absorbed component in the gas; and the concentration of the absorbent in the solution. The dimensionless coefficient is a function of temperature and is found from the expression. A sub t equals 3O times 10 to the minus 6th power. (Pr sub l(C sub l times t)) to the 2.7th power, where C sub l equals 50 kg/cu m Na2CO3 and t is the operating temperature of the scrubber. The dimensionless expression fits well the experimental data and can be used to calculate the principal dimensions and values of operating parameters of hollow scrubbers for absorption of H2S from coke gas. This is illustrated by a detailed calculation of a hollow scrubber for cleansing of 60,000 cu m/hr of coke gas containing 15 grams/cu m of H2S at a temperature of 30 C and a Na2CO3 concentration in the solution of 50 kg/cu m to a required degree of purification of 90%.

18185

Jordan, C. W., A. L. Ward, and W. H. Fulweiler

GUM DEPOSITS IN GAS DISTRIBUTION SYSTEMS. Ind. Eng. Chem., 27(10):1180-1190, Oct. 1935. 31 refs.

The efficacy of iron sulfide for the absorption of nitric oxide, together with conditions favoring its use, was determined by a series of experiments involving the absorption of undiluted and dilute nitric oxide by iron sulfide, and alkaline and metallic sulfite absorbents. The highest activity for the absorption was obtained by sulfided Lux iron oxide to which sufficient sodium bicarbonate had been added to give an alkali ratio of 50%. Iron sulfide is economically feasible as an agent for the commercial purification of manufactured gases because it can be made from the hydrogen sulfide already present in commerical gas, and it is not poisoned by sulfur of cyanogen compounds, reduced by hydrogen, or affected by carbon dioxide or carbon monoxide. Though it does react with the small

amount of oxygen present in manufactured gas, iron sulfide can be used to advantage in removing hydrogen sulfide from gas. As a result of the laboratory experiments, an inexpensive, commercial process was developed for removing all of the nitric oxide.

18197

Riese, Wilhelm

THE USE OF ACTIVATED COAL FOR THE REMOVAL OF SMALL CONCENTRATIONS OF NITROGEN OXIDES FROM GASES. (Ueber die Brauchbarkeit von Aktivkohle fuer die Entfernung geringer Gehalte von Oxyden des Stickstoffs aus Gasen.) Text in German. Brennstoff-Chem. (Essen), 21(3):25-36, Feb. 1, 1940. 7 refs.

Laboratory experiments with 200 cm and 100 liters activated coal showed that it is chemically, technically, and economically feasible to use it for the removal of nitrogen oxides from waste gases of a coking plant. The waste gas develops in a thermal cracking process during which water vapor is added. The gas is subsequently washed under pressure with water and lye. It is low in, but not free of, tar-forming hydrocarbons. To achieve a high efficiency of the activated coal, the use of pressure is recommended. The efficiency of the activated coal is low if the concentration of tar-forming hydrocarbons is high. Thus, original coking gas is less suited for activated coal treatment than is coking gas converted by thermal cracking. Generally, it can be said that activated coal can only be used for NO removal if the gases are free of substances which soil the surface of the coal. The situation is somewhat different if the benzene in the coking gas is recovered simultaneously with NO removal, since the costs of regenerating the activated coal are partly covered by the revenue obtained from the sale of benzene. Simultaneously with NO, NO2 is also removed to prevent corrosion by the flue gases. The use of the activated coal method for removal of small concentrations of nitrogen oxides under pressure is simple and even inexpensive if the gas is to be compressed anyway. Consumption of activated coal is low, particularly since the coal spent by NO adsorption from cracking gas can be used for adsorption elsewhere instead of fresh coal. The reaction mechanism is probably characterized by adsorption of nitrogen oxides on activated coal and reaction with active C-atoms of the coal surface. In addition, reaction of the nitrogen oxides with certain unsaturated hydrocarbons and the action of oxygen may play a role.

37056

Charadame, R.

THE AERODYNAMICS OF FLAMES. Preprint, Inst. of Combustion and Fuel Technology of Canada, Ottawa (Ontario), 19p., 1970. 12 refs. (Presented at the North American Fuel Technology Conference, Ottawa, Ontario, May 31-June 3, 1970, Paper Inst. F-NAFTC-1.)

Research studies carried out by the International Flame Research Foundation and the Centre d Etudes et Recherches des Charbonnages de France on the aerodynamics of flames are summarized. Oil, coke-oven gas, pulverized coal, and natural gas flames were investigated. Specific research areas were variables influencing flame properties, especially radiation; interactions between pure aerodynamic phenomena and physicochemical phenomena occurring in flames; development of the theoretical flame model of flame jets; and tests with both model and industrial-scale furnaces. The studies demonstrated the importance of total momentum flux at the burner for combustion and radiation and the importance of recirculation currents in the pre-ignition phase. The total momentum flux governs the mixing between fluid leaving the burner and the surrounding combustion air: the more the momentum flux increases, the more rapid the mixing becomes and the shorter the flame. While rapid mixing with secondary air retards ignition, rapid mixing with recirculated gases speeds it up. The studies described made it possible to improve the efficiency of pulverized coal boilers, the operation of cement kilns, and gas production from coke ovens.

45369

Dvornikov, A. G.

INCREASED CONCENTRATIONS IN CERTAIN COAL FRACTIONS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim., no. 9:6-7, Sept. 1971. 5 refs.

The mercury contents of fractions of some Donbass coals were analyzed. The mercury content gradually increased from the coarsest to the finest size fraction, reaching a maximum for the below 0.1 mm fraction. The three finest fractions contained less fusinite and vitrinite and far more pyrite than coarse fractions. The relationship between fusinite and vitrinite contents and fraction density was almost linear. The mercury content of the carbonaceous clay shale increased in the low-density fractions. However, the heaviest fraction contained a high proportion of mercury in clay shale. The mercury content of coal fractions is related inversely to their vitrinite and fusinite contents and directly to their pyrite and clay shale contents. The mercury found in anthracites is associated with the pyrite present. The methods used to concentrate mercury in the light and heavy fractions of anthracite can be used to recover mercury from coals in the course of normal cleaning.

G. EFFECTS-HUMAN HEALTH

00621

D.J. Von Lehmden, R. P. Hangebrauck, J.E. Meeker

POLYNUCLEAR HYDROCARBON EMISSIONS FROM SELECTED INDUSTRIAL PROCESSES. J. Air Pollution Control Assoc. Vol. 15(7):306- 312, July 1965.

A number of selected industrial processes considered as potential sources of benzo(a)pyrene and other polynuclear hydrocarbons was surveyed. Polynuclear hydrocarbon emission levels were measured directly for asphalt hot road mix preparation and asphalt air blowing. Emissions of other pollutants, including particulate matter, carbon monoxide, and total gaseous hydrocarbons were also measured, and are reported together with pertinent data on process design and operation. Results are discussed with reference to the type of process; the type of equipment used, including control devices; and other factors. The significance of some additional processes as contributors of polynuclear hydrocarbons was examined indirectly by collecting atmospheric samples of polynuclear hydrocarbons in residential areas in the vicinity of (1) a carbon black manufacturing area, (2) a steel and coke manufacturing area, (3) an organic chemical industry complex, and (4) a residential and small-industry coal burning area. (Author abstract)

02561

V.B. Kapitul'Skii

PHYSIOLOGICAL CHANGES ENCOUNTERED IN WORKERS EMPLOYED IN THE PITCH-COKE INDUSTRY. (O nekotorykh fiziologicheskikh sdvigakh u rabochikh pekokoksovogo provizvodstva.) Hyg. Sanit. CFSTI: TT66-51160/1-3

1. Workers at a pitch-coke plant showed marked changes in certain physiological functions as compared with a control group. 2. Such changes were found in cardiovascular, respiratory, and muscle function, as well as in the central nervous system. Changes in certain physiological indicators, such as muscular strength, latent period of motor response to sound and chronaxie, can be explained as due to the combined effect of various unfavorable environmental factors. Among these factors, aerosols of pitch and pitch distillates appear to play an essential part, judging by the considerable changes in certain physiological functions found in workers employed on the preliminary processing of pitch, who perform relatively easy tasks at normal efficient technological processes and by the mechanization of operations involving heavy physical labor. In addition, serious attention should be paid to individual protective measures, including respirators, goggles, antipitch pastes. The workers should also be medically examined at regular intervals.

05450

Kapitulskii, V. B. and Kogan, L. A.

A COMPARISON OF THE HYGIENE CHARACTERISTICS OF THE SMOKELESS AND ORDINARY METHODS OF CHARGING COKE OVENS. Coke Chem. (USSR) (Engli Transl.) (8) 29-31, 1966.

The hygienic effectiveness of a technique of smokeless charging of coke ovens is evaluated by comparing the atmospheric contamination above a battery charged the normal way and one using the smokeless charging method. The smokeless charging involves the diversion of the bulk of the escaping coke-oven gas, coal dust, and tar into the coke side gas collecting main which is connected to the ovens for the charging period. The smokeless charging reduced the dust concentration from 143-2250 mg/cu m to 57 mg/cu m, the carbon monoxide from 40-74 mg/cu m to 6-18 mg/cu m, and the heat exposure from 6.9-13.5 cal/sq cm min to 2.3-5.2 cal/sq cm min with the time of maximum heat exposure cut from 39 to 18 percent of the working shift. In 1964, the sick rate was 18 percent less than for workers using the normal charging method, with the incidence of catarrh one half and that of bronchitis one-sixth in the case of smokeless charging, the mechanization of the opening and closing of the charge holes has improved the contamination problem on top of the ovens with further changes indicated in trapping the dust from pushing the coke and dry quenching.

08150

Itskovich, A. A.

THE STIMULABILITY OF THE OLFACTORY ANALYSER IN THE HYGIENIC EVALUATION OF ATMOSPHERIC AIR POI LUTION. In: Survey of U. S. S. R Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech. Vol. 3, p. 106-109, May 1960 CFSTI: TT 60-21475

The functional shifts in the human organism which resulted from atmospheric air pollution by volatile products of the coke-chemical industry were investigated. The effect of these substances on the state of the olfactory analyzer in various population groups was used as the selective index of pollution effects. In the selective group-studies crystalline phenol and thymol were used as the odor- emanating substances. Tests were made on 241 individuals divided into 4 groups. Group 1 consisted of workers and technical personnel of a coke-chemical plant; Group 2 consisted of residents within 500 - 1000 m from the production plant; group 3 consisted of school children living in the same area; group 4 consisted of employees of the Sanitary Institute who had no direct connection with the source of the atmospheric air pollution. Determinations made with the aid of the Elsberg-Levy olfactometer showed that in 66.6 percent of workers under study and of persons residing 500 - 1000 m from the coke-chemcial plant the threshold of coke-chemical odor perception was above the normal. The same was true of 50 percent of the youngsters of school age. The results of olfactory threshold determinations were in complete agreement with the anamnestic data secured from the same population groups. The changes observed in the olfactory sensitivity of the groups were of a specific character and could be regarded as effects of the coke- chemical atmospheric air pollutants. It was noted that persons with pronounced changes in the olfactory sensitivity resided within 500 1000 m from the source of atmospheric air pollution where, according to analysis, the concentrations of phenol compounds in the air ranged between 0.167 - 0.237 mg/ cu m.

This should be taken into consideration in the determination of the limit of allowable concentration of phenol in atmospheric air.

H. EFFECTS-PLANTS AND LIVESTOCK

26418

Babkina, V. M.

GROWTH AND DEVELOPMENT OF ORNAMENTAL HERBACEOUS PLANTS IN COKE CHEMICAL WORKS. In: American Institute of Crop Ecology, Survey of USSR Air Pollution Literature. M. Y. Nuttonson (ed.), Vol. 2, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 8-12. (Also: Okhrana Priorody na Urale, 1966:173-176, 1966.)

A study was undertaken to determine the effect of smoke vented by a coke-chemical works on various ornamental plants. The air over three plots contained sulfur dioxide ranging in concentration from 0.75 to 4 mg/cu m, while the fourth plot was free of noxious gases. Test plants exposed to 0.75 mg/cu m did not differ in height from the plants grown in the control plot. All bore fruit and produced good seed. Smoke pollutants stimulated the growth of the Dahurian lily and of the whiterim camomile, while phlox was severely damaged and the hybrid peonies less so. Of the 46 tested plants, 25 reacted slightly to 2 mg/cu m of the polluted air. Thwarted growth processes were noted, however, with the Chinese pink, great bellflower, Aztec marigold, and others. Dahlias and lupines were severely damaged, producing few and freqently deformed flowers. With 4 mg/cu m of polluted air, 25 of the 46 species perished during the developement of the cotyledons. In most species the phase of vegetative growth was extended, and the duration of blooming as well as the entire growth period was shortened. A number of plants are recommended for growing in areas exposed to sulfur dioxide.

39571

Masek, Vaclav

THE INFLUENCE OF FLY DUST FROM COKING PLANTS ON SOME BIOLOGICAL PROCESSES OF PLANTS. (Der Einfluss des Flugstaubes aus der Kokerei auf einige biologische Prozesse de Pflanzen). Text in German. Gesundh. Ing., 93(3):77-80, March 1972. 17 refs.

The influence of three typical samples of fly dust from a coking plant on enzymatic reactions, photosynthesis, chlorophyll concentration in leaves of bean plants was studied. The hydrolysis of starch with amylasis and of the albumen with pepsin at 37 C and the inversion of sacharosis by invertase in a buffered environment were also examined. None of the three dust samples showed a signification activity in enzymatic reactions. Applying the dust samples to the leaves of young bean plants reduced the intensity of photosynthesis and the chlorophyll concentration. In aqueous extracts, the dust samples liberated only small quantities of nutrients. Plants which were grown in a dust suspension showed no increase of dry substance and growth rate. A stimulating effect of the dust samples on root growth was determined. A mixing of the dust samples with the soil influenced the accessibility of water to plants.

44777

Harney, Brian M., Donald H. McCrea, and Albert J. Forney

AERIAL DETECTION OF VEGETATION DAMAGE UTILIZING A SIMPLE 35-MM CAMERA SYSTEM. Preprint, Air Pollution Control Assoc., Pittsburg Pa., p. 1-18, 1972. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-160.)

A 35-mm camera bank and aerial photography were used to detect and determine the extent of vegetative stress or damage by various pollutants in low concentrations. Photography involved the visible and near infrared bands of the electromagnetic spectrum. Multispectral photography was also utilized. The test site chosen included three large coal-fired power plants and a complex of beehive coke ovens, and was subject to relatively unpredictable and frequent ground haze conditions. The film apparatus and procedure are described. Results indicate that the use of a small hand-held, manually operated camera is operationally and economically more advantageous than the use of aerial photography. Color infrared film was helpful in discriminating tree species and in haze-cutting ability. Its ability to identify stressed trees was better than conventional color film in some cases, marginal in others. This property varies with cyan contribution in the image. The air pollution damage to vegetation was not extensive. The symptoms found indicated oxidants as the cause, with sulfur dioxide from the power plants as a contributing factor. The damaging effect of coke oven effluents was severe and easily detected in aerial photographs. The major damage was localized to the area adjacent to the coke ovens.

45389

Kozyukina, J. T. and V. I. Obraztsova

DYNAMICS OF TREE DAMAGE DUE TO COKE-CHEMICAL INDUSTRY GASES. (Dinanika povrezhdayemosti drevesnykh rasteniy gazami koksokhimicheskogo proizvodstva). Text in Russian. Uch. Zap. Perm. Gos. Univ., no. 256:191-196, 1971. 11 refs.

Weekly examination of decoloration, spotting, lifetime, and xenomorphism of leaves and tree growths (height and volume) were made during 1968-1969 on a series of 10 to 15-year-old trees exposed to atmospheres polluted with sulfur compounds, phenols, ammonia, and coal dust. Injury to trees was observed. Harmful changes were most pronounced in older trees, and decreased in poplar, ailanthus, mulberry, acacia, English elm, and were smallest in privet. A direct relation was observed between the extent of xenomorphism and plant resistance to polluting gases. (Author abstract)

I. EFFECTS-MATERIALS

26313

Cherkasov, N. Kh., L. K. Gorin, and R. Ya. Kolesnikova

OPERATION OF THE CYCLE OF FINAL COOLING OF COKE GASES. (O rabote tsikla konechnogo okhlazhdeniya koksovogo gaza). Text in Russian. Koks i Khim., no. 10:33-35, 1970. 4 refs.

The problem of corrosion in closed-system terminal cooling of coke gases, due to the absorption of hydrogen sulfide, hydrogen cyanide, and other acidic gases, and the concommitant interference with benzene removal were studied. Flushing the water through absorbing resins is not effective in removing these corrosive agents which simply act to degrade the resin. Hence, a closed cooling system does not seem feasible.

36804

Zaychenko, V. M., I. I. Rozhnyatovskiy, E. N. Kucheryavyy, D. D. Vorobyev, A. P. Sergeyev, M. S. Komarovskiy, and L. F. Vasyutin

FACTORS CAUSING ACCUMULATION OF CORROSIVE COMPONENTS IN ABSORPTIVE OIL. (Prichiny nakopleniya korrozionno-agressivnykh komponentov v poglotitelnom masle). Text in Russian. Koks i Khim., no. 5:28-33, 1969. 1 ref.

Factors contributing to the accumulation of corrosive substances within the recycling oil utilized in the absorption of benzene from coke processing were investigated. Sulfides, cyanides and thiocyanates are absorbed by the recycling oil within the gas exchange facility (absorber) where contact between gaseous and oily phases occurs under increased pressure. The circulating oil contains approximately 50-90 mg/L chloride ion and 110-150 mg/L sulfate ion. Accumulation of aggressive compounds within the absorptive oil is enhanced by chemical reaction occurring under the circumstances. Along with hydrogen sulfide and cyanide, oxygen from coke gas is absorbed as well. This oxygen produces the oxidation of hydrogen sulfide and other sulfides to polysulfides. Polysulfides react readily with cyanide to produce thiocyanates. Decrease in H2S and HCN concentrations within the absorptive oil due to these reactions leads to the absorption of new amounts of sulfides from the coke gas. Increased pressure enhances these processes producing accumulation of corrosive thiocyanates within the recycling oil. To prevent corrosion of the benzene producing equipment, procedures for the removal of H2S before the aromatic hydrocarbon absorption stage should be developed. The countercurrent procedure with alkaline solutions for the capturing of H2S within the absorber section appears to be unsatisfactory for the mentioned purposes.

K. STANDARDS AND CRITERIA

12277

Sayfutdinov, M. M.

EXPERIMENTAL DATA PROPOSED FOR THE DETERMINATION OF MAXIMAL ALLOWABLE AMMONIA CONCENTRATION IN ATMOSPHERIC AIR. In: The Biological Effects and Hygienic Importance of Atmospheric Pollutants, Book 10. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 17, pp. 67-76, 1968. CFSTI: PB 180522T

Air quality studies near several industries, especially metallurgical plants having coke oven gas and nitrate operations on the premises showed that these were the chief sources of atmospheric air pollution with ammonia. 0nvestigations conducted with workers and with laboratory animals led to the conclusion that the subthreshold ammonia concentration which had no affect on the cerebral cortex biopotentials is at the 0.2 mg/cu.m level, which can be regarded as its maximal allowable single concentration in atmospheric air. Under conditions of chronic inhalation exposure such a concentration proved toxicologically inactive. On this basis such ammonia concentration can be recommended as its maximal allowable limit in atmospheric air.

35390

Plaks, Norman

IMPROVED PROCESSING METHODS FOR CONTROL OF AIR POLLUTION EMISSIONS FROM COKEMAKING. Preprint, Economic Commission for Europe, 27p., 1971. 3 refs. (Presented at the Seminar on Problems of Air and Water Pollution in the Iron and Steel Industry, Leningrad, USSR, Aug. 23-28, 1971.)

In the United States, the first set of Federal emission standards for coke plants will probably cover charging of the ovens, largely because the control technology necessary will be demonstrated sooner than the control technology for other stages of coke production. Afterwards, there will be a demonstration of new technology for controlling the emissions from pushing of coke. Standards have been established for conventional slot-oven coke plants; emissions from all new installations cannot exceed the measured quantity emitted by the demonstrated processes. The next step will be to build and demonstrate the capabilities of air pollution control technology applied to a continuous or formcoke plant. Standards established for a continuous coking plant should limit emissions to levels considerably lower than those permitted for slot-oven plants. All coke plants built after the standards are promulgated will not be allowed to emit more pollutants than a well-controlled continuous coke plant emits. By adherence to this program, coke-plant emissions, under Federal legislation, will, by an evolutionary process, be decreased to a level that has been established by the application of the best technology available. (Author conclusions)

38578

Duprey, R. L.

THE STATUS OF SOX EMISSION LIMITATIONS. Chem. Eng. Progr., 68(2):70-76, Feb. 1972. 7 refs.

The Clean Air Act, as amended, will undoubtedly result in more stringent sulfur dioxide limitations to achieve the national ambient air quality standards. In addition, many jurisdictions are expected to reduce the sulfur content of fuels to less than 0.3%, and the Environmental Protection Agency has proposed restricting sulfur oxides emissions from new steam-generating plants to 0.8 and 1.2 lb/million Btus of heat input for liquid and solid fossil fuels, respectively. Present state and local restrictions on fuel sulfur content, which are tabulated together with emission standards in equivalent sulfur levels, range from 0.3% to 2.7% for fuel oil and 0.2% to 3.6% for solid fuel. The new restrictions will have a substantial impact on the coal industry and petroleum refinery operations faced with the desulfurization of petroleum products. Sulfur recovery plants will need to operate more efficiently in removing sulfur from petroleum refining, natural gas processing, and coke oven gas. Control techniques employing tail-gas cleaning are available to reduce sulfur oxide emissions well below 0.01 lb of sulfur processed. Primary nonferrous smelters are faced with regulations that require about 90% reduction in sulfur oxides emissions. Existing sulfuric acid plants are expected to be restricted to 6.5 lb of sulfur oxides/ton of acid and new plants to 4.0 lbs of sulfur oxides/ton of acid.

L. LEGAL AND ADMINISTRATIVE

11914

L. N. Samoilovich, and Yu. R. Redkin

AIR POLLUTION WITH 3,4-BENZPYRENE FROM PETROLEUM AND CHEMICAL INDUSTRIES. ((Zagryaznenie atmosfernogo vozduha 3,4-benzpirenom predpriyatiyanii neftehimirkeskoi promishlennosti.)) Text in Russian. Gigena i Sanitariya, 33(9):10-14, Sept. 1968. 7 refs.

The 3,4-benzpyrene concentrations of 193 air samples from 2 petroleum refineries, one chemical plant, and the city of Grozny, collected for 3 years by an ERV-49 aspirator and adsorbed on the organic FPA-15 tissue, were determined after extraction with benzene and dilution with n-octane. The refineries had 0.1-40 mKg microgram/100 cu m (with values of 0.8-40 mKg/100 cu m in coke shops), the chemical plant (pyrolysis shop) 0.9-9.1 mKg/100 cu m, and the city sections (distance 50-2000 m from a contact coke plant) 0.08-0.40 mKg/100 cu m maximal 3,4-benzpyrene concentrations. The emission was the highest during full-capacity production, with 2-4-fold increase in a contact coke plant of refinery No 2. By order of the city sanitary physician refinery No2 was closed down temporarily. The furnaces were supplied with gas-forming fuel and hermetization was carried out. It was concluded that within a 2-km radius from a petroleum refinery, there is considerable 3,4-benzpyrene pollution. The most significant sources were the coke and pyrolysis shops.

28584

Mahler, E. A. J.

AIR POLLUTION. Chem. Brit., 6(5):201-203, May 1970.

The legal basis for air-pollution control in the United Kingdom is the Alkali and Works Regulation Act of 1906. Originally covering only the chemical industry, the scope of the Act now includes a considerable portion of heavy nonchemical industry, including ironworks, steelworks, power stations, gasworks, coke ovens, and certain brick works. The main provision of the Act requires works to use the best practicable means to prevent the emission of any noxious or offensive gases and to render unavoidabl emissions harmless and inoffensive. The second requirement is usually met by discharging at such a height that ground-level concentrations are low. Routine inspections help insure compliance with the standards set by the Chief Alkali Inspector. Chemical plants scheduled under the Alkali Act cause little neighborhood air pollution. However, increasing production will require either development of new processes with an inherently lower proportional rate of emission or improvement of abatement measures.

32517

Dreyhaupt, Franz J.

IN DISHARMONY BEYOND THE GOAL. (Im Zwiespalt am Ziel vorbei). Text in German. Umwelt (Duesseldorf), 1(4):15-17, Aug. 1971.

Laws and regulations in Germany concerning the prevention of air pollution are incomplete on federal and state levels. The technical directives (TA) passed in 1964 require permits for the construction, alteration, and operation of a plant only if it is equipped with the latest air pollution control facilities. The maximum allowable emission concentrations within the reaches of the plant may not be exceeded by the emissions of the plant. The list of TA maximum allowable emission concentrations includes dust (without differentiation between toxic and non-toxic); nitrous gases; chlorine; hydrogen sulfide; and sulfur dioxide. The concentration limit for hydrogen sulfide is far too high, since it is above the odor threshold. Concentrations prevailing on days of inversion weather are excluded from consideration. The air pollution control systems in coking plants, steel plants, non-ferrous metallurgical plants, oil refineries, the chemical industry, thermal power plants, and refuse incinerators must be improved.

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